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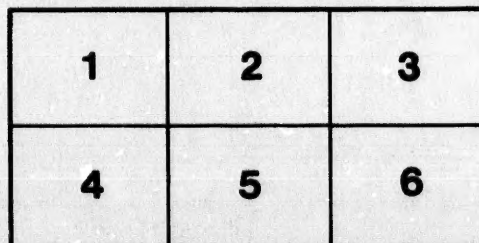
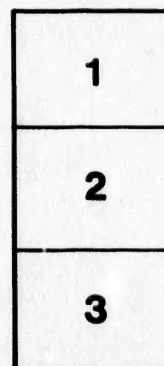
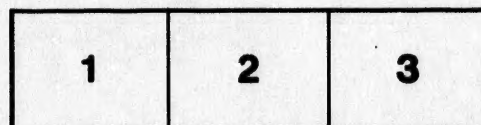
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IN

PRE

SYNOPSIS

OF

NATURAL HISTORY,

BY

A. MACALLUM,

PROVINCIAL MODEL SCHOOL, TORONTO.

IN EXPLANATION OF THE AUTHOR'S CHART OF NATURAL HISTORY.

Toronto:

PRINTED AT THE OFFICE OF THE CHRISTIAN GUARDIAN.

1857.

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SYNOPSIS

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GENERAL REMARKS.

The world we inhabit is a globe 7912 English miles in diameter. Its circumference is 24,853.339, and its superficial area 196,664,255.75 Eng. square miles. This surface consists of land and water. The former occupies 52,353,231 square miles: the latter 144,463,427: the true proportion being as 266 to 734. The solid contents of this sphere are 259,333,411,782 cubic miles. Some idea of the vastness of our globe—small as it is when compared with its elder sisters of creation—may be formed from the statement that if Lycurgus, the Spartan lawgiver, who flourished 884 B.C., had commenced in that year to count the number of cubical miles of our earth's solidity, counting day and night at the rate of three every second, this sage of antiquity would not yet have completed his task. Our earth is surrounded by an aerial ocean extending at least 45 miles beyond its surface. The weight of the atmosphere is equal to an ocean of water 32 feet deep, or of mercury 30 inches in height, or to a globe of lead 66 miles in diameter. The pressure upon the earth is equal to five thousand millions of millions of tons!

The naked crust of our planet is covered with a carpet of plants and flowers, unevenly woven, varied from the pole to the equator, here dense and there sparse, here luxurious, there stunted. The marvellous variety, both in form and organism, of the subjects of the vegetable kingdom, may be inferred from

the fact, that already 100,000 different species have been described: and every day increases the number. Among the stately forms of the tropics, the less luxuriant forests of the temperate zone, and the dwarfed productions of the arctic regions, where returning frosts nip the early blossoms of spring and prevent the autumnal seeds from ripening, there roam in all directions, countless numbers of other, higher, and more complex beings, adapted to a wider range of existence, and prepared to undergo change of climate, place or atmospheric temperature, to which plants are entire strangers. Animals and plants, in many ways, are inseparably connected. Both follow, with wonderful precision, the laws of their geographical distribution. And while the vegetable kingdom obtains its nourishment from the mineral, it in its turn yields the support, directly and indirectly, essential to the economy of animated creation. Great though the number of minerals, metals and earths may be, numerous as are the plants covering the crust of our planet, and varied and diversified though the animals now existing or whose remains are exhumed by geological research may be; yet the simple or elementary substances—simple because nothing differing from themselves has been obtained from them—of which ocean, land, plants and animals are formed, number little more than three score.

Viewing life in its simplest aspect as “the mutual exchange of relations,” we have in this the bond of union common to everything surrounding us. This is the life of a mineral, of a continent, of the world itself, in all their sympathies, antipathies, and elective affinities. And although an impassable chasm separates the mineral from the vegetable, and as impassable a gulf intervenes between the plant and the animal; which is again equalled by the distance intermediate between the animal and man; yet it is impossible to say where the inorganic ends and the organic begins, and equally difficult to assign their proper limits to the vegetable and animal creations. In plants, this life, common to everything, is subordinate to another principle of existence—vegetable life; in the animal both are subservient to a still higher principle—animal life: finally, in man all are instrumental in furthering the requirements of spiritual life. How wonderful the combination! Not more so, however, than that everything in the composition of minerals, plants, animals and man—all things physical around us—are referable to one or more of the few substances composing the crust of our planet and the atmosphere which floats around it.

MINERAL KINGDOM.

A Mineral may be defined as a substance having neither life, in its usual acceptation, motion nor feeling. The mineral department of Nature consequently embraces all things destitute of these properties. The Classification of minerals depends entirely on the object aimed at, and will differ with the standard assumed. It may refer to their comparative geologic age, their distribution, medicinal properties, basic characteristics, agricultural value, or their commercial importance. We have given the simplest, as it seems to us the most natural, but we are far from supposing it necessarily the best. The only characteristics upon which entire dependence may be placed are their structure and composition. Matter is known to us in three forms, solid, liquid, and aeriform. The gases constitute the first or lowest class, and throughout the whole Chart the ascending order is observed.

The great importance of a knowledge of this earliest form of matter will appear from a few facts respecting the gas, Oxygen (*οξυς* sour, *γενναιν* to generate). It is the most active and energetic as well as the most widely distributed agent in nature. It forms one-fifth of the atmosphere, eight of every nine pounds of water, and is supposed to form fully one-half the ponderable matter of our globe. It is the most powerful supporter of combustion, and is essential to respiration in the animal economy. Its symbol is O, combining number 8, i.e., it like all other substances combines with other materials only in definite proportions by weight and measure or multiples thereof. Its affinity for almost all the elementary substances is strong. This gas weighs 1.11, being a little heavier than air. Water at 62° Fah. for all solids and liquids, and atmospheric air for all gases are the standards in determining their specific gravity. As every person has seen more or less of the next Class—the Non-Metallics, such as Sulphur, and Carbon or pure coal, they may be passed over without occupying much space, the object of this part of the chart being to present a convenient mode of seeing the symbols, combining numbers, and specific gravities of the simple substances. Phosphorus (*φως* light, *φερω* I carry) in union with Calcium and Oxygen constitutes the material of bones of animals. The substances placed in the next class, Solid-Metalloids, (metal, and *ιδος* like,) are by many considered as much entitled to the term Metals as those placed in the fourth Class. Sodium and

Potassium are respectively the bases of the Soda and Potash of commerce. Their symbols Na and Ka are from the German Natrium and Kalium, the names by which they are known in that language. So great is their affinity for Oxygen that when thrown on water they decompose it, seizing the oxygen and causing the Hydrogen (*ὕδρ* water, *γεννᾶν* to generate), the other element of water, to burst into flame; thus affording a beautiful experiment if performed in the dark. In the fourth Class are arranged those substances usually called pure metals, the most important of which are iron, gold, silver, copper, tin, platinum and mercury. The most prevalent of the elementary substances—those entering largely into the rocky masses of our globe are oxygen, carbon, sulphur, aluminum, silicon, potassium, sodium, calcium, magnesium, and iron. Very few of these simple bodies are used by animals directly. The vegetable kingdom is the great laboratory of Nature, wherein these substances are prepared for animal use. Almost all of them, if taken in their uncombined state, would be rank poison; but in union with others equally destructive to animal life, they are not only innocuous but highly conducive to health and comfort. Common salt itself, chloride of sodium, is a compound of the gas chlorine and the base sodium, either of which taken separately would put an end to our existence. Masses of the same material are held together by homogeneous, and those formed of two or more ingredients by elective attractions.

“The proportionate volume and gravity of elementary molecules furnish another evidence of design in the beginning of the creation. Suppose there had been no fixed proportion regulating the union of oxygen and nitrogen, but that they would mix with each other in any and in all proportions; then there could have been no adjustment of the lungs of animated beings to the atmosphere. Proportion in the one was necessary, in order that there could be adaptation and adjustment in the other. So of other compounds which affect other parts and processes of the animal economy. If there had been no definite proportions, in which alone the elementary substances would compound themselves, there could have been no adjustment of the organs of motion and life to the conditions of nature.” Design is the impress of Creation.

VEGETABLE KINGDOM.

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Vegetable

Kingdom, comprehends every thing that has life, but neither motion nor feeling—from the lowly mushroom, the fern and the moss to the towering oak, and the cedar of Lebanon—from the microscopic plant to the majestic Baobab with its diameter of thirty feet. In duration they are as remarkable, some flourishing for a few days, others for thousands of years. The *Olea fragrans* reserves its sweetness for the midnight hour, and the night-flowering *Cereus* turns night into day. It begins to expand its sweet-scented blossoms at twilight, it is full-blown at midnight, and closes with the dawn of the morning, never to open again. The variety of plants is also very great. One hundred thousand distinct species have already been described, and every day accessions are made to that number. The adaptation of living structures to the varieties of soil and climate, and the relation of plants to each other, render the study of Botany (*Botany* a plant) interesting to all, especially to the young as furnishing continued proofs of Divine goodness and wisdom. The laws by which the vegetable creation is regulated, are simple and easily comprehended. Economy of causes and exuberance of effects,—simplicity of laws and complexity of results,—order, harmony and beauty—are everywhere manifested in all branches of Natural History. How noiselessly do the flowers exhale their rich perfume, or the trees of the forest rear their majestic heads. Every plant has its place. Monopolies obtain not among them; colours of every hue adorn them, not merely for ornament but for use. Different shades of colour absorb varying degrees of heat. Different plants require different degrees of heat to bring their seeds to perfection. Though latent heat is evolved by the various transmutations that take place in the interior of plants,—they, like animals, having a tendency to a temperature of their own, independent of external circumstances,—yet they receive nearly all their heat from the same source, the sun. The exact amount of caloric requisite for each plant is thus supplied, while God has so adapted our perception of the beautiful that the varied hues of plants no less than the blending colours of the “bow of promise,” increase our happiness and deepen our veneration. The language of the heart is “There’s not a flower or shrub that grows, but shows its Maker God.” Many curious phenomena are presented in the vegetable kingdom. The sunflower turns instinctively towards the sun: the barberry folds its stamens over the pistil, if the latter be pricked with a pin: the *hedysarum gyrans*, found only on the

banks of the Ganges, moves its leaves without any assignable cause: the mimosa or sensitive plant folds its leaflets when shaken or touched, as if it feared some harm: while the sun-dew and certain species of the pitcher-plant are provided with an apparatus for killing insects, from which they are supposed to derive some nourishment. Irritability is unquestionably a property of plants. Poisons kill them, and they possess an excretory power. Plants can imbibe nothing unless in a state of solution. The wheat plant, for example, requires a great amount of sand in the construction of its incomparable stem. It can imbibe not a particle unless in a soluble state, and it has no power of its own to dissolve silex. Should a particle of potash be placed in the soil, it will dissolve any sand in its vicinity. Both may then be taken up by the plant: the sand being deposited in its place in the stem or leaves in its solid condition, the potash that held it in solution is liberated, being no longer necessary, and is thereupon returned to the soil, again to dissolve more sand, be carried up by the ascending current of sap and again returned to the soil in endless succession. Many contend that plants are endowed with instinct, lower in kind perhaps than that of animals, but not less instructive. Plants send their roots in the direction of good soil. The bean will find a pole placed at a short distance from it, though it be shifted daily: if, after it has twined some distance up the prop, it be unwound and twined in the opposite direction, it will return to its original position or die in the attempt. If two plants grow near each other, neither of them being supported, one of them will alter the direction of its spiral and they will twine round each other: if a pan of water be placed near the stem of a young pumpkin, it will approach it and place one of its leaves on the water: if good soil be placed above the roots, though their natural tendency is downward, they will ascend to reach it. Other instances might be given, but these are sufficient to induce the enquiring mind to pursue this interesting department of study.

The geographical distribution of plants is a subject of great importance. They are supposed to have had their origin in distinct localities or districts, and afterwards to have spread in every direction, winds, birds, waves, and tides being laid under tribute to facilitate their dissemination throughout the climatic zones congenial to each species. It is impossible to say where life is most abundant—whether on the continents or in the unfathomed depths of the ocean. The black glacier flea (*Desoria glacialis*) and

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Podurellæ—the latter of which in countless myriads may be seen at times on the snows of Canada—may be found in the crevices and tubular spaces of the northern glaciers : lichens and mosses are not unfrequently found flourishing beneath great quantities of snow. Plants affect the atmosphere in a very peculiar manner. Animals by absorbing oxygen, causing it to unite with the carbon of the blood and form carbonic acid—a gas deleterious to animals—render the air unfit for respiration. This mephitic air is a principal ingredient in the food of plants ; the other substances are water and ammonia, together with the inorganic portion extracted from the soil. They imbibe these substances, and having decomposed them return the oxygen, that which animals want, to the air, and consolidate the carbon, water, and nitrogen into wood, leaves, flowers and fruit. Thus we behold a reciprocal dependence existing between the animal and vegetable creations. The former by inspiration consume the oxygen of the air, the latter restore it by exhalation, and in their turn consume the carbonic acid exhaled by animals. “ Few of the great cosmical phenomena have only one end to fulfil ; they are the ministers of the manifold designs of Providence.” No person can attentively observe the flowers around us everywhere—those presents God has sent us—without becoming wiser and better as they lead us to love and reverence Him. No secondary causes intervene. They are pure and fresh from his hand. On a lovely evening in May a person was reading his favorite Plato. He was sitting in the grass mixed with flowers, on the banks of the crystal Colorado of Texas. Dim in the distant west arose with smoky outlines, massy and irregular, the blue cones of an offshoot of the Rocky Mountains. He was perusing one of the strangest of his dreams. It laid fast hold on his fancy without exciting his faith. He wept to think it could not be true. At length he came to that startling passage, “ God geometrizes.” “ Vain revery,” he exclaims, casting the volume on the ground at his feet. It fell by a beautiful little flower that looked as fresh and bright as if it had just fallen from the rainbow. He broke it from its silvery stem, and began to examine its structure. Its stamens were five in number, its calyx had five parts, its delicate coral base had five parts expanding like the rays of an ordinary star-fish. This combination of five in the same blossom appeared very singular. It had never occurred to him before. The last sentence he had read in the page of the pupil of Socrates was

ringing in his ears, "God geometrizes." There was the text written long centuries ago, and here this little flower in the remote wilderness of the west furnished the commentary. Then suddenly passed before his eyes a faint flash of light—he felt his heart leap in his bosom. The enigma of the Universe was unfolded. Swift as thought he calculated the chances against the production of those three equations of five in only one flower by any principle devoid of reason to perceive number. He found one hundred and twenty-five chances to one against such a supposition. He extended the calculation to two flowers by squaring the sum first mentioned. The chances amounted to the large sum of 15,625. He cast his eyes around the forest; the old woods were literally alive with those golden blossoms from which countless bees and butterflies were sipping honey-dews. His feelings he could not describe. His soul became a tumult of radiant thoughts. He took his beloved Plato from the grass where he had thrown him in a fit of despair. Again and again he pressed him to his bosom as a mother would her darling child. He kissed alternately the book and the blossom, bedewing them both with tears of joy. In his wild enthusiasm, he called to the birds on the boughs, trilling their cheery farewell to departing day, "Sing on sunny birds, sing on sweet minstrels. Lo you and I have still a God!" "If God so clothe the grass of the field which to-day is and to-morrow is cast into the oven, shall He not much more clothe you, oh ye of little faith?"

In the solar system the sun, all the primary and secondary planets revolve on their axes in the same plane, and in their orbits in the same direction. Had these matters been left to accident, the chances against this uniformity, though calculable, would have been inconceivably great. Laplace states them at four millions of millions to one. Arguments of a similar nature may be inferred from many of the objects around us. The number and constancy of our fingers and toes furnish an example. The argument is cumulative to any extent.

Few things can interest the young more beneficially than the contemplation of God's handiwork in the temple of Nature. One of the reasons assigned for the study of mental philosophy is, that, go where you will, mind is always present—mind so wonderfully endowed, that whether we roam over the barren heath, the sandy desert or the frozen north, or are shut up in a dungeon, it can appropriate mentally all that has been discovered in regions

however distant, and can call into being within itself a world as free and imperishable as the spirit by which it has been conceived. Flowers, shrubs, fruits and plants, are all but omnipresent. Their contemplation is always conducive to delicacy of sentiment and amenity of manners. "When in the middle ages religious enthusiasm suddenly re-opened the sacred East to the nations of Europe, who were sinking into barbarism, our ancestors in returning to their homes brought with them gentler manners, acquired in those delightful valleys."

In the Classification of vegetables two celebrated systems have obtained among naturalists—the Artificial and the Natural. The former was originated by Linnæus, a Swede, born at Røeshult, 1707. Based upon peculiarities of structure which are not constant even in different individuals of the same species, and which have little or no connection with the Physiology of plants, it frequently causes the most dissimilar specimens to be arranged in the same class. Its simplicity and the ease with which it may be acquired will always secure it a place in scientific research. Destined to be surpassed by its rival, it nevertheless forms an easy introduction to the latter method, which was greatly improved by Jussieu of Paris, and more recently by Dr. Lindley of London. It is an attempt to place next each other plants having the greatest resemblance in structure, external and internal, properties and uses. Plants in the Artificial method are placed like words in a dictionary, not according to their meaning, but in accordance with their initial letter. The Natural places in juxtaposition those related in meaning—in family groups, like words derived from the same root: The sexual system of Linnæus depends upon the number and relative position or degree of combination of the stamens and pistils. The Vegetable Kingdom is divided into Classes, these subdivided into Orders, these into Families, these into Genera, Species, Varieties and Individuals.

CLASSES AND ORDERS OF THE LINNÆAN SYSTEM.

Classes.

CLASS I. Stamens 1, Mo-nan'-dri-a (*μονος* one, *ανης*, *ανδρος* man—one stamen), examples: ginger, arrow-root.

II. Stamens 2, Di-an'-dri-a (*dis* twice—two stamens), examples: olive, sage, lilac.

III. Stamens 3, Tri-an'-dri-a (*τρεις* three), examples: wheat, rye, barley, oats.

IV. Stamens 4, Te-tran'-dri-a (τετρα four), examples: innocence, dodder, holly.

V. Stamens 5, Pen-tan'-dri-a (πεντα five), examples: tobacco, potato, flax, grape.

VI. Stamens 6, Hex-an'-dri-a, (ἕξ six), examples: rice, lily, tulip, sorrel.

VII. Stamens 7, Hep-tan'-dri-a (ἑπτα seven), examples: horse-chestnut, wintergreen.

VIII. Stamens 8, Oc-tan'-dri-a (ὀκτο eight), examples: fuchsia, buckwheat, cranberry.

IX. Stamens 9, En-ne-an'-dri-a (ἐννια nine), examples: laurel, rhubarb, cinnamon, camphor.

X. Stamens 10, De-can'-dri-a (δεκα ten), examples: mahogany, saxifrages.

XI. Stamens 12—19, Do-de-can'-dri-a (δωδεκα eleven), examples: mignonette, euphorbia.

XII. Stamens 20 or more, inserted into the calyx; I-co-san'-dri-a (ἱκοσι twenty), examples: plum, apple, rose, strawberry.

XIII. Stamens 20 or more, inserted into the receptacle; Po-ly-an'-dri-a (πολυς many), examples: poppy, tea, mandrake.

XIV. Stamens 2 long and 2 short, Did-y-na'-mi-a (dis two, δυναμις power), examples: honeysuckle, acanthus.

XV. Stamens 4 long and 2 short, Tet-ra-dy-na'-mi-a (τετρα four), examples: cruciferæ, cleome.

XVI. Stamens united by their filaments into a tube, Mo-na-del'-phi-a (μονος one, ἀδελφος brotherhood), examples: geranium, baobab.

XVII. Stamens united by their filaments into two parcels, Di-a-del'-phi-a [dis two], examples: pea, sweet-pea, clover.

XVIII. Stamens united by their filaments into several parcels, Pol-y-a-del'-phi-a [πολυς many], examples: lemon, orange.

XIX. Stamens united by their anthers into a tube, Syn-ge-ne-si-a [συν together, γινω I grow], examples: dahlia, dandelion.

XX. Stamens united by the pistil, Gy-nan'-dri-a [γυνη female, ανηρ male], examples: milkweed, lady's-slipper.

XXI. Stamens and pistils in separate flowers, but both growing on the same plant, Mo-næ'-ci-a [μονος one, οικος house], examples: Indian-corn, sage, cucumber.

XXII. Stamens not only in separate flowers, but those flowers situated on two different plants; Di-æ'-ci-a [di two, οικος house], examples: willow, hop, hemp.

XXIII. Stamens separate in some flowers, united in others, either on the same plant or different ones; Pol-y-ga'-mi-a [*πολυς* many, *γάμος* marriage], examples: mimosa, ash, maple.

XXIV. Stamens either not ascertained, or not discoverable with any certainty, inasmuch that the plants cannot be referred to any of the foregoing classes; Cryp-to-ga'-mi-a [*κρυπτος* concealed, *γάμος* marriage], examples: mosses, ferns, lichens.

Orders.

The characters of the Orders depend upon the number of the styles, or of the stigmas if there be no style, in the first thirteen classes; such are accordingly named:—

Mon-o-gyn'-i-a [*μους* one, *γυνή* female—one style or stigma], 1 style, ex. ginger.

Di-gyn'-i-a [*δύς* two—two styles or stigmas], 2 styles, ex. lilac.

Tri-gyn'-i-a [*τρεις* three], 3 styles, ex. pepper.

Tet-ra-gyn'-i-a [*τετρα* four], 4 styles, ex. *parnassia*.

Pen-ta-gyn'-i-a [*πεντα* five], 5 styles, ex. flax.

Hex-a-gyn'-i-a [*ἕξ* six], 6 styles, ex. sago.

Hep-ta-gyn'-i-a [*ἑπτα* seven], 7 styles, stork's-bill.

Oc-ta-gyn'-i-a [*οκτο* eight], 8 styles, ex. poplar.

En-ne-a-gyn'-i-a [*εννα* nine], 9 styles, ex. dog's-mercury.

De-ca-gyn'-i-a [*δεκα* ten], 10 styles, ex. papaw-tree.

Do-de-ca-gyn'-i-a [*δωδεκα* eleven], 12 styles, ex. water-soldier.

Pol-y-gyn'-i-a [*πολυς* many], more than 12 styles, ex. *cycas*.

In the 14th class, *Didyna'mia*, the orders depend upon the nature of the ovary. In *Gymnosper'mia* (*γυμνος* naked, *σπέρμα* seed), the first order, the ovary is divided into four lobes, from the base of which proceeds a single style, and within each of which is contained a single seed. In *Angiosper'mia* (*αγγειον* vessel or covered), the 2nd order, the ovary is not lobed, and is usually two-celled and many-seeded.

In the 15th class, *Tetradyna'mia*, the orders are characterized by the form of the fruit: *Siliquosæ* (*siliqua*, pod or husk) have the pods long; the *Siliculosæ* (diminutive of *Siliqua*) have them short.

The orders of the 16th, 17th, and 18th classes, *Monodel'phia*, *Diadel'phia*, and *Polyadel'phia*, depend upon the number of the stamens, having the nomenclature the same as the first thirteen classes.

The orders of *Syngene'sia* are determined by the arrangement of their flowers and by the sex of their florets.

The orders of the 20th, 21st, 22nd, and 23rd classes are determined by the number of the stamens.

The 24th class is divided into orders according to the principles of the Natural system; namely, 1 Filices, 2 Musci, 3 Hepaticæ, 4 Algæ, 5 Fungi.

FLORAL PROVINCES.

The prevalence of certain plants, as well as the predominance of particular races of animals in certain districts, has led to the attempt to divide the whole earth into floral provinces, each distinguished by characteristic vegetation. This is done in accordance with the idea now generally adopted, that each species, whether of plants or animals, originated in a single birth-place—the doctrine of specific centres. M. Schouw, a Danish professor, in an elaborate work has delineated this kind of novel geography, and reckons twenty-two great floral divisions of the earth, each subdivided into lesser provinces.

FIRST REGION, of the mosses and saxifrages, comprising all the Alpine and Arctic localities; mosses, lichens, gentian saxifrages, and similar forms.

SECOND REGION, that of the cruciferous plants, extending from the Arctic circle, and from the lower limits of Alpine forms on the mountains, over the whole north of Europe, and part of northern Asia. Nine hundred species have been counted, comprising the cabbage, turnip, and other common vegetables.

THE THIRD REGION, that of the mint tribes, or midland flora, comprising the countries bordering on the Mediterranean; and in this province tropical forms are first met with.

FOURTH, Japan and the adjacent continent, the Region of the buckthorn and honeysuckle tribes.

FIFTH, the eastern part of North America.

SIXTH, the southern part of North America, the Region of magnolias.

SEVENTH, Mexico and the West Indies, the Region of the palm and the cactus.

EIGHTH, Peru, the abode of the Chincona, the quinine and fever-bark trees.

NINTH, the South American Highlands, with their evergreen shrubs.

TENTH, Chili, the land of calceolarias.

ELEVENTH, Buenos Ayres and the eastern coast of S. America, the domain of peculiar flower-bearing trees.

TWELFTH, the Antarctic circle.

THIRTEENTH, New Zealand.

FOURTEENTH, New Holland, the country of gum trees and peculiar forms.

FIFTEENTH, South Africa, the home of encalypta and heaths.

SIXTEENTH, Western Africa.

SEVENTEENTH, Eastern Africa, rich in ferns.

EIGHTEENTH, India, the Region of the ginger tribe.

NINETEENTH, the Indian Highlands.

TWENTIETH, Cochin China.

TWENTY-FIRST, Arabia and Persia, rich in spices, and ornamented by the yellow-haired acacia.

TWENTY-SECOND, the South Sea Islands, the Region of the bread-fruit tree.

THE NATURAL SYSTEM OF CLASSIFICATION.

The Natural System is based on the principle that, "the proof of a classification of plants being natural, is furnished when similar results are arrived at, whether from considerations drawn from the *reproductive* organs, or from those of *vegetation*." In this respect plants are divided into two great classes, Phenogamous (*φαινω* I appear, *γamos* marriage; stems and pistils visible) and Cryptogamous (*κρυπτος* concealed, and *γamos* marriage; concealed fructification). The former is again subdivided into two classes. Thus the whole vegetable kingdom viewed in respect to the seeds of plants, consists of three sub-kingdoms,

I. A-CO-TYL-E'-DON-OUS (*α* without, *κοτυλεδων* cotyledon or seed-lobes), Ferns, Mosses, &c. Cryptogami-a of Linn.

II. MON-O-CO-TYL-E'-DON-OUS (*μονος* one, cotyledon or seed-lobe), frequently called Endogens (*ενδον* inside, and *γινωμαι* I grow). The veins of their leaves are usually parallel: grasses, lilies, asparagus, and similar plants, palms, pines, &c.

III. DI-CO-TYL-E'-DON-OUS (*δισ* twice, two-lobed), generally called Ex'ogens (*εξ* out or outside), so called because they grow by adding successive layers to the outside. The leaves are reticulated, (rete, a net.) Their stems consist of pith, older wood, newer wood or sap, and bark. The embryo has two cotyledons and their flowers are usually formed on the quinary type.

The following TABLE will give a succinct view of the system :

Sub- Kingdom.		Class.
I. Acotyledons		1
II. Monocotyledons	{ Monohypogynæ (μονὴς one, ὑπο under, γυνή woman ; stamens hypogynous.)..... 2 Monoperigynæ (περί about ; stamens perigynous) 3 Monoepigynæ (ἐπί upon. 4	
(Monoclines, flowers hermaphrodite.		
Apetalæ (no petals)	{ Epistamineæ, (stamens epigynous) 5 Peristamineæ, (stamens perigynous) 6 Hypostamineæ, (stamens hypogynous) 7	
Motopetalæ, (petals united.)	{ Hypocorollæ, (corolla hypogynous) 8 Pericorollæ, (" perigynous) 9 Epicorollæ, corolla { Synantheræ (anthers united)..... 10	
Polypetalæ, (petals distinct.)	{ epigynous } Chorisantheræ (anthers free)..... 11 Epipetalæ, (petals epigynous) 12 Peripetalæ (" perigynous) 13 Hypopetalæ (" hypogynous) 14	
Declines, flowers unisexual or without a perianth		15

" It may be observed that this system, being founded partly on individual organs, is, also, in some degree artificial. Rigid, precisely scientific distinctions, are not found in nature, which seems to prefer gradual, or almost imperceptible transitions from the simplest to the most complex of her developments."

ANIMAL KINGDOM.

Zoology (ζῷον animal ; λόγος a discourse) is the science of animals, or that branch of Natural History which teaches the nature, propensities, and instincts of animals ; their classification, geographical distribution, and succession upon the earth. The origin, size, number, and classification of animals now claim our attention.

"It may be observed that this system, being founded partly on individual organs, is, also, in some degree artificial. Rigid, precisely scientific distinctions, are not found in nature, which seems to prefer gradual, or almost imperceptible transitions from the simplest to the most complex of her developments."

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Some persons have advocated the idea that all the higher animals, including man himself, have sprung from lower creatures, these from lower still, till we reach the limit of animated creation. There, however, they do not stop, but boldly affirm that these were produced from vegetables, and these in their turn from the foam of the sea, the slime by its shore, or that they sprang out of the earth itself; that the whole phenomena of life is connected with the electric fluid, if not entirely dependent upon it. This hypothesis is based on the idea that any creature placed in favorable circumstances will produce in the lapse of ages a progeny higher in organization, more perfect in form; in fine, superior to itself. Man, according to this hypothesis, is but a monkey removed by a series of developments from the initial type. But when were monkeys ever placed in more favorable circumstances than within the historic period of our planet? Has a single case of actual development ever been witnessed? Has it ever been affirmed to have taken place? When a single instance of a higher animal produced from a lower on the development hypothesis shall be incontestibly proved, then, and not till then, may the advocates of this system consider they have some tangible basis on which to rest their notions, now at variance with reason, experience, and revelation. The truth seems to be that the seeds of species, whether by law or the direct fiat of God we say not, were produced with the conditions that were best adapted to develop and sustain the parents and progeny. Many of the geologic changes that occurred prior to the creation of man were destructive to whole races of beings, and the altered condition of things was not only not better for the previously existing species, but invariably the cause of their total extinction. Degeneracy in species, has marked the progress of our planet. New and higher orders always succeeded these catastrophes, not by developments from previously existing animals, but by successive creations. Is not the whole process alluded to in the graphic description of Israel's bard, Psalm civ., 29th and 30th verses: "Thou hidest thy face, they are troubled; thou takest away their breath, they die, and return to their dust. Thou sendest forth thy spirit, they are created: and thou renewest the face of the earth."

The size of animals is almost as varied as their numbers are great. A few years ago the national debt of Great Britain was eight hundred millions pounds sterling; the population of the globe was stated to be eight hundred millions of inhabitants, and it

was likewise asserted that the creatures in a single drop of water were at least eight hundred millions. A globule of human blood if magnified 180,000 times would not exhibit an image larger than the accompanying figure. ● Many of the animalcules are still smaller: 2000 of them placed together would measure only the twelfth part of an inch. Ehrenberg has computed that a cubic inch contains the remains of 41,000,000,000 creatures! The largest land animal is the elephant, weighing some tons; the smallest the white mouse, "two of which just weigh one copper half-penny." In the ocean the largest is the whale, found not rarely to measure from 60 to 100 feet. The largest bird is the ostrich, seven feet high, the smallest the humming bird. The condor, the giant of the vulture tribe measures 16 feet across the wings, and is the largest bird that flies.

It has been estimated that the number of species of animals now on the globe is about 250,000. We may safely suppose the fossil species equal to those now living. This would give us one-half a million of species. What a hopeless task it would seem for any person to attain to any knowledge of such a multitude of beings. But though one man can do very little, the labour of many in different countries and in all ages can accomplish a great deal. And by transmitting the knowledge acquired in one generation to that which succeeds, those following in the path of science start from the vantage ground attained by the labours of their predecessors. Besides by the division of animals into kingdoms and classes, like a country divided into provinces, counties, &c., each group in the animal department of nature is parcelled out into smaller divisions, and known by distinctive appellations. At first sight we may say that beasts walk on land, birds fly in the air, and fishes swim in the water. This is correct, but not sufficiently precise for the zoologist. Is the bat a bird because it flies? or the whale a fish because it swims and lives in the sea? A judicious teacher will always seek by such questions to *elicit* the *information* of his pupils by engaging them in such inquiries. The difference between a bat and a bird is, the one is covered with fur and the other with feathers; the one has a mouth with teeth, the other a horny beak; the bat is born alive and suckled by its parent, the bird is hatched from an egg. Some years ago the question, whether a whale was or was not a fish, was discussed at full length in New York. A dealer in oil refused permission to the Government inspector of fish-oil to examine his stock, alleging

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he had only whale oil in his warehouse, and that as the whale was not a fish he had no business with it. The Government brought it before the legal tribunal. On the one side it was argued that the whale was always spoken of as a fish, even by those engaged in the trade, the term whale-fishery implying the same idea; that in books of high authority, a stock of which was produced in evidence, the whale was always classed among fishes, and that whale oil had uniformly been charged with duty as such. On the other side it was contended, that the language of uneducated sailors should not be regarded as evidence; that the classification of old authors was based on a very imperfect knowledge of the structure of animals; but if they wanted high antiquity they should go to the oldest writer on natural history,—Moses, who in his record of the creation mentioned whales as distinct from fishes,—“And God created great whales, and every living creature that moveth, which the waters brought forth after their kind.” Fish breathe by gills, the whale by lungs; the former is cold-blooded, the latter warm-blooded. The heart of the fish has two compartments, that of the whale four; the young of the one are brought forth alive and suckled, those of the other are produced from spawn; the one attends to its young with affectionate solicitude, the other knows nothing about them. The differences between them were numerous, striking, and sufficiently dissimilar to have the creatures placed in separate classes, yet the Government gained the case. But at the very next session of Congress the Act was changed, so that all trouble, on that score, in future, would be avoided. It is obvious that structure, external and internal, must form the basis of classification. Ail organs must be taken into account before we can arrive at any true systematic arrangement, and the accuracy of this will altogether depend on the amount of our knowledge. Animals should be so arranged as to exhibit their true affinities, and to embody the most comprehensive truths regarding them yet elicited by the collective wisdom of the cultivated men who have examined, with such splendid results, the domain of Zoology.

There is no subject so pleasing to the youthful mind—so well calculated to drive away the whims and the phlegm from the fretting spirit, as one connected with natural history,—one which presents Nature in her floral grandeur, her verdant luxuriance, and her woodland minstrelsy. But apart from the mere pleasure which this study yields, its importance as a mental exercise cannot

be too highly estimated. The perceptive faculties are called into active exercise to detect points of similarity and interest, and by the admirable harmony which pervades the whole field of study, the mind is trained to order, accuracy, and arrangement, and purified by the reflection that all these wonderful works proceed from the same Divine power whose providential care is manifested over all. Parents and teachers should accustom those under their care to watch closely the habits and instincts of animals, to mark the differences which subsist, the variety and the beauty everywhere presented; for it is a duty as well as a privilege to study with the deepest interest the works which in so striking a manner display the wisdom, power, and goodness of Him in whom we live, and move, and have our being. A number of individuals having the same characteristics constitutes a variety, such as the five races of man, breeds of cattle, &c. A number of varieties collected together constitutes a species; all the species of any kind of animals constitute a genus; genera added together form a (sub-family among birds) family or tribe; families or tribes united form an order, such as the rases among birds, the carnivora among quadrupeds; orders joined together constitute a class; classes put together constitute a sub-kingdom; sub-kingdoms again constitute a kingdom; and kingdoms constitute the empire of Nature. The knowledge of these particulars respecting animals may be called the alphabet of the science, while the grammar may be said to consist of such a knowledge of the divisions of the animated creation as will enable the student of nature to learn, from the name, much respecting the structure, habits, and character of any specimen under consideration, of which he would otherwise be ignorant. This may be illustrated by taking any creature—a bird, a cat, or a dog; the last would thus be described by a naturalist. Let us suppose a large Newfoundland dog. 1. In the individual animal no one is interested save its possessor. 2. All the Newfoundland dogs constitute the variety known by that name. 3. Then if every variety of dogs be collectively considered they will compose the species *canis familiaris*. Linnæus could detect no characteristics to distinguish them from the wolf, except the peculiar way in which the latter carried its tail. 4. It belongs to the genus *Canis* (Lat. dog), distinguished from the other genera of the same tribe or family by a peculiar adaptation of the teeth to live partly on vegetable food. 5. It belongs to the family or tribe *Canidæ*

(canis, dog; *idæ* like.) It is distinguished from the bear and badger tribes by walking on the end of its toes instead of the sole of the foot. The former mode is termed Dig'-it-i-grade (*digitus*, a finger or toe; and *gradior*, I walk), and the latter Plant'-i-grade (*planta*, the sole of the foot; and *gradior*, I walk). It is separated from the Fel'idæ (*felis* a cat), which are also digitigrade, by the absence of the power to retract the claws, possessed by the cat kind.

6. It is one of the order Carniv'ora (*caro*, *carnis*, flesh; and *voro*, I eat), characterized by its possessing claws, or nails, and three kinds of teeth—inci'sors, or cutting teeth; canine, or dog-teeth; and molars, or grinders. In these respects it agrees with man and monkeys, which constitute the eleventh and twelfth orders of the class; but it differs from them in not having a thumb opposable to the rest of the fingers, and in the adaptation of the teeth and general structure to preying on animal food. In these respects, again, it agrees with the hedge-hog, mole, and other species of the order *Insectiv'ora*; but it differs from them in having the molar teeth raised into cutting edges instead of conical points, and in the great size of the canine teeth, by which it is adapted to devour the flesh of large animals rather than insects.

7. It belongs also to the class *Mammalia* (*mamma*, breast), the members of which produce their young alive and nourish them afterwards by suckling; they breathe air by lungs during the whole of their lives, and their blood maintains a fixed and elevated temperature; they are generally covered with hair, live on land (except whales, &c.), and are altogether the most highly organized of the *Vertebra'ta*. All the preceding is included in saying, that an animal belongs to the class *Mammalia*; and this much may be communicated, very easily, to a person but slightly acquainted with natural history.

8. It is a member of the sub-kingdom *Vertebra'ta* (*vertere*, to turn). By this it is known to possess a jointed back-bone, containing the spinal marrow, and expanded at one end into the skull, the cavity of which contains the brain; it has red blood, five senses, and not more than four legs or members. These are but a few of the particulars involved in the idea of *Vertebra'ta*, as distinguished from the other sub-kingdoms.

9. It belongs to the animal kingdom. It is, therefore, a being endowed with powers of sensation, of voluntary motion, and with a stomach for the reception and digestion of its food.

10. It belongs to the Empire of Nature, because it exists. All things of a physical nature by which we are surrounded are embraced in this term, Empire of Nature.

The last term, Empire of Nature, includes every thing by which we are surrounded. It embraces the three kingdoms, Mineral, Vegetable and Animal. Of the first and second enough has already been said; it remains to allude briefly to the last. Its divisions are the four Sub-kingdoms:

FIRST, RA-DI-A'-TA (radius, a ray)

rayed animals, star-fish, &c. This sub-kingdom contains four classes:

FIRST, IN-FU-SO'-RI-A (infundo, I pour in), containing the infusory animalculæ, which are for the most part developed in infusions of decayed vegetable matter. Pol-y-gas'-tri-ca (many stomachs). Ro-tif'-er-a (rota, a wheel, and fero, I carry), wheeled animalculæ.

SECOND CLASS, EN-TO-ZO'-A (εντος in, ζωα animals), internal parasites, tape-worm, common worm, &c. "Some get within him".

THIRD CLASS, ZO-O-PHY'-TA (ζωον animal, and φυτον a plant), contains the orders

First, Hy-droi'-da (hydra, and ειδος like);

Second, As-ter-oid'-a (aster, star; and ειδος, like), corals;

Third, He-li-an-thoi'-da (ηλιος the sun, ειδος like), sea anem'o-ne;

Fourth, As-cid-i-oi'-da (ασκος, a bottle, and ειδος like), polype, sea-mats, &c.

FOURTH CLASS, RA-DI-A'-RI-A, rayed animals proper. It contains three orders: First, sea-nettles; Second, sea-urchins; and Third, the star-fish.

SECOND, MOL-LUS'-CA (mollis, soft),

containing six classes,

FIRST CLASS, TU-NI-CA'-TA (tunica, a tunic), having a leathern kind of cloak or tunic. As-cid'-i-a communis or paps.

SECOND, BRA-CHI-O'-PO-DA (βραχιον, arm; and πους, foot). Ter-e-brat'-u-la, Lingula, Orbicula.

THIRD, LA-MEL-LI-BRAN-CHI-A'-TA (lamella, a thin plate; and branchiæ, gills), plate-shaped gills, oyster, mussel, cockle, unio—found in our Canadian lakes, clam-shells, solens.

FOURTH, PTER-O'-PO-DA (πτερον a wing, and πους a foot), wing-footed animals, the most remarkable of them being the clio borealis, or northern clio, which abounds in the northern seas,

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and though not exceeding an inch in length, forms the greater part of the food of the whale, (*Balæna mysticetus*).

FIFTH, GAS-TER-O'-PODA (γαστήρ, stomach; πους, a foot), stomach-legged creatures, such as snails, slugs, limæa and murex.

SIXTH, CEPH-A-LOP'-O-DA [κεφαλή the head, πους foot], head-footed creatures. All the species are marine, sexes distinct. Placed by many as the highest of the Invertebrata. Cuttle-fish, nautilus, ammonites. About 5000 species of Mollusks have been described.

THIRD, AR-TIC-U-LA'-TA (articulus, a joint),

jointed creatures, numbering about 200,000 species. Its classes are five in number:

FIRST, AN-NEL-LA'-TA (anellus, a little ring), containing the orders:

First, *Suc-to'-ri-a* (sugo, I suck), leeches;

Second, *Ter-ri'-cola* (terra, the earth; and colo, I cultivate), common earth worm (*lumbricus*) *na'-ia-des* (*na'-ya-deez*) &c.

Third, *Tu-bi'-cola* (tubus; and colo, I inhabit or cultivate), the *serpula*, *sabella*, &c.

Fourth, *Dor-si-bran-chi-a'-ta* (dorsum, back; branchiæ, gills), *syllis monilaris*, &c.

SECOND CLASS, CIR-RIP'-E-DA (cirrus; and pes, a foot), containing two orders:

First, *Sessile* (*sedeo*, I sit), *bal'anus* (an acorn) or acorn-shells.

The coronula is found on the backs of whales; other species attach themselves to the backs of turtles.

Second, *Pe-dun-cu-la'-ta* (pes, foot), barnacle, &c.

THIRD CLASS, CRUS-TA'-CE-A (crusta, a hard covering), a class of free articulate animals, with articulated limbs, a branchial respiration, and a dorsal ventricle or heart. It is subdivided into ten orders:

First, *Lim'-u-li* (*limus*, oblique—sidelong) or King crabs; to which group the fossil *Tri'-lo-bite* (*tris*, three; *lobus* a lobe) are supposed to belong.

Second, *Os-tra'-po-da* (οστράκον a shell, πους foot), the cypris.

Third, *Cope'poda*, usually called One-eyed Cy'clops (*monosculus*) from their eyes being united. Their fecundity is truly astonishing.

Fourth, *Phyllo'poda* (φυλλον a leaf, πους foot), gill or leaf-footed; *branchipus*, *artemia salina*, or brine-shrimp.

Fifth, Clado'cera ; daphnia pulex or water flea is a common example.

Sixth, Iso'poda (ισος equal or alike, πους foot), creatures having all their feet alike, and adapted for motion and prehension ; oniscus or wood-louse.

Seventh, Læm-mo-dip'-oda (λαίματος throat, πους foot), cyamus, usually called the whale-louse because they always infest the cetacea as parasites. All the species are marine.

Eighth, Am-hip'-o-da (αμφις on both sides, πους foot), feet diversely conformed. The sand-hopper is a well known British species.

Ninth, Stom-a'-po-da (στομα a mouth, πους a foot), squilla mantis, &c.

Tenth, Dec-a'-po-da (διστα ten, πους), including those creatures which have ten thoracic feet, crabs, lobsters, shrimps, &c.

FOURTH CLASS, IN-SEC'-TA, (in; and seco, I cut), embracing all those articulate animals having the body composed of three distinct parts,—the head, corslet or thorax, and abdomen or body ; the legs, six in number, with usually two or four wings attached to the thorax ; and along the sides of the abdomen minute punctures, called spiracles, by means of which respiration takes place.—Entomology (εντομα insects, λογος a discourse) is the science of insects. A person versed in this study is called an Entomologist, and is described as an individual who gives to insects long names and short lives, a place in science and a pin through the body. The insects are divided into the following orders :

First, Co-le-op'-ter-a [κολεος sheath, πτερον a wing], sheath-winged, wings four, the upper pair hard, sutures straight. Ex. stag-beetles, chafers.

Second, Or-thop'-ter-a [ορθος straight, and πτερον], straight-winged. Ex. crickets, grasshoppers, &c.

Third, Neu-rop'-ter-a [νευρον a nerve, and πτερον], nerve-winged, wings four, membranaceous, anus unarmed. Ex. dragon-flies, may-flies.

Fourth, Hy-men-op'-ter-a (υμην a membrane, and πτερον), membrane-winged, wings four, membranaceous, anus aculeate. Ex. bees, ants, saw-flies, &c.

Fifth, Strep-sip'-ter-a [στρεπτος twisted, and πτερον], twisted-winged, possessing rudimental elytra in the form of linear and spirally-twisted scales. Ex. stylops, &c.

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Sixth, Lep-i-dop'-ter-a [*λίπης* a scale, and *πτερον*], wings four, covered with scales. Ex. butterflies, moths, &c.

Seventh, He-mip'-ter-a [*ἡμιπύς* half, and *πτερον*], wings four, the upper pair moderately hard and incumbent. Ex. cicada, water-scorpions, &c.

Eighth, Dip'-ter-a [*δις* twice, and *πτερον*], two-winged ; halteres two, in place of posterior wings. Ex. flies, gnats, &c.

Ninth, Ap'-ter-a [*α* without or privative, and *πτερον*], wingless, wings none, no metamorphosis. Ex. fleas, spring-tails, &c.

FIFTH CLASS, A-RACH'-NI-DA (*ἀράχνη* spider,—from *αράχης* slender, and *ίχθυς* a track, slender-tracked creatures,—and *ίδος* form). It is separated into two orders :

First, Pulmona'ria (palmo, a lung), including those creatures which breathe by means of pulmonary sacs or lungs. Ex. lunged spiders and scorpions.

Second, Tra-chea'gia (*τράχεια* windpipe), those of the class Arach'nida which breathe by means of tracheæ. Ex. air-pipe breathers, mites.

FOURTH, VERTEBRATA.

We now approach the confines of life in a higher and nobler state of existence. The class Ver-te-bra'-ta comprehends all creatures having a jointed back, including man himself. True its lowest members, the fishes, are but a step in advance of those forms we have been considering. The ascent is gradual, but not on that account the less certain. What particularly characterizes the vertebrata (verto, I turn) is the expansion of the backbone at one extremity into the skull, the cavity of which contains the brain, represented in lower orders by ganglionic knots. The connection between the action and size of the brain and the amount of mental effort that can be put forth by different individuals has been satisfactorily established ; but how the soul acts through the medium of the brain is not so clearly defined. It affords matter for reflection to compare the mass of the brain with the mass of the spinal cord. In the lowest of the vertebrata, Pisces or Fishes, it is only two to one. In the Amphibia it is two and a half to one : in the A'ves or Birds it is as three to one : still ascending, in the Mammalia generally it is four to one ; while in man it attains the great development indicated by twenty-three to one. This gives us the physical cause of man's elevation above the brute creation. His erect posture, his thumb opposable to the rest of his fingers, reason instead of instinct,

the procuring and use of fire, and the faculty of speech, may be noticed as characters distinguishing man, stamping him the superior of all the animated creation. This sub-kingdom contains five classes.

FIRST CLASS, PIS'CES or FISHES. They are grouped into nine orders.

First or Lowest, Cyclostomata or Cy-clos'-to-mi (κυκλος a circle, and στομα a mouth) ; lamprey, hag, &c.

Second, Selachii or Se-la'-cii (σιλαχος a kind of grisly, scaleless fish), including rays and sharks.

Third, Chondropteryg'ii (χονδρος a cartilage, and πτερυξ a fin) ; sturgeons.

Fourth, Plectog'nathi (πλεω I connect, and γαθος a jaw), which includes those fishes having the maxillary bone ankylosed to the sides of the intermaxillaries, which alone form the jaws ; sunfish, &c.

Fifth order, Lophobran'chii (λοφος a tuft, and βραγχια gills), those whose gills are in small tufts, and disposed in pairs along the branchial arches, as the pipe-fish, hippocampus.

Sixth, Malacopteryg'ii Apo'da (μαλακος soft, and πτερυξ a fin ; and α not, and πους a foot). All those fish in which the ventral fin is wanting form but one natural family, the Murænidæ or eel tribe.

Seventh, Mal. Sub-Branchiata [βραγχια gills], fishes having the ventral fins brought forward beneath, or even in advance of the pectoral fins ; cod, flounder, turbot, brill and common sucking-fish.

Eighth order, Mal. Abdomina'les [abdomen, the belly], having the ventral fin situated under the abdomen, behind the pectorals. Salmon.

Ninth order, Acanthopteryg'ii [ακανθος a spine, and πτερυξ a fin or wing], characterized by the bony spines which form the first ray of their dorsal and anal fins

These are the orders of fishes, creatures of which it may be said, they are produced from eggs, and, generally speaking, covered with scales, cold-blooded and aërate their blood by gills. Eight thousand species have been described.

SECOND CLASS, AM-PHIB'-I-A [αμφις both, βιος life], embraces all animals capable of living either on land or for a time in the watery element. In organization they are superior to fishes, though considerably removed from the higher walks of animated life. Some members of this class possess two sets of respiratory organs, one adapted to breathe air, the other to aërate the blood

by exposing it to water. Those only that retain them both through life can properly be styled true Amphibia. Placed between fishes and reptiles they are oviparous and cold-blooded; that is, the temperature of their blood is very little above the medium in which they live: their skin is soft and naked, and they are destitute of scales or plates. At first they are in the form of water-breathing fish, then their metamorphosis takes place; after which, very closely resembling reptilia in character, they attain the perfection of their kind. Some of them lose the tail, but generally the caudal appendage adheres to them through life. The peculiar structure of the Amphipneustæ, to which the Menobranchus found occasionally in our own lakes, and the siren belong; the use of the toad to gardeners and others, in repressing the inordinate increase of insects, worms, and slugs, on which it feeds; its patient endurance, the lightning-like movement of its tongue, and the extreme beauty of its eyes, together with the perfectly harmless nature of the whole class should not only defend the members thereof from violence and cruelty, but to the lover of nature form a very interesting subject for reflective thought, as exhibiting wonderful adaptation to existing circumstances, which is indeed everywhere apparent. This class is subdivided into five orders.

First, Apoda [α without, $\pi\omicron\upsilon\varsigma$ foot]; water-serpent, &c.

Second, Abranchia [α privative, $\beta\rho\alpha\chi\chi\iota\alpha$ gills]; menopoma.

Third, Amphipneustæ [$\alpha\mu\phi\iota\varsigma$ on both sides, $\pi\upsilon\omega$ I breathe], by many considered as forming the only true amphibia, as they are provided with lungs and gills at the same time.

Fourth, Urodelæ [$\upsilon\rho\alpha$ a tail, $\delta\eta\lambda\omicron\varsigma$, manifest]: their tail is preserved through all the stages of their existence. Salamanders, tritons, &c.

Fifth, Anoura [α without, and $\upsilon\rho\alpha$ a tail], such as the toad and frog, which lose the tail on arriving at maturity.

THIRD CLASS, REPTILIA (repto, I creep) OR REPTILES, constitutes the next class in the Animal Kingdom. Its orders are five in number.

First, Ophidia [$\omicron\phi\iota\varsigma$ a serpent, $\epsilon\delta\omicron\varsigma$ a form], or serpents; including all the serpentiform species of this class: adders, rattlesnakes, boas, pythons, &c.

Second, Sauvia [$\sigma\alpha\upsilon\rho\omicron\varsigma$ a lizard], Saurians: they have four legs, as the lizard. The remains of singular and gigantic saurians are frequently exhumed from the rocky strata of the earth.

Third, Lorica-ta [lorica, a coat of mail]: this includes all

those species which are protected by an armour of bony plates, such as the crocodiles, alligators, &c.

Fourth, En-al-i-o-sau'-ri-a [*εν* in, *αλ*, the sea, and *σαυρος* a lizard]. All its genera are fossil. Their paddles, like those of the whale or turtle, were combined with the head and trunk of a crocodile: the ich-thy-o-sau'-rus and ple-si-o-sau'-rus belonged to it

Fifth, Che-lo'-ni-a [*χελωνη* a tortoise]: this order includes the tortoises, turtles and terrapenes, characterized by the body being enclosed in a double shell, out of which extend the head, tail, and four extremities. Some of its members, e. g., the land tortoise, have the power of retracting these parts within the shell.

FOURTH CLASS, AVES OR BIRDS. We now come to the volatile race, a more interesting division of the Animal Kingdom than that of which we have just been speaking, and equally displaying the creative energy of Nature's God, "whose plastic hand" has embellished them with so great a variety of colours, given them such a diversity of instincts suitable to their modes of life, and furnished them in so admirable a manner with a conformation of body perfectly corresponding with their habits and dispositions. Their whole structure is admirably calculated to facilitate their motion through the air: their bony framework is formed of hollow tubes, which not only give lightness and buoyancy, but much greater strength than if solid; while their feathery covering, so regularly and smoothly arranged, offers not the slightest resistance to the elastic air. In breathing, not only their lungs, but their quills and hollow bones are filled with air, thus altering their specific gravity so as to admit of rapid flight; while their temperature being so high, ranging from 100° to 110°, while that of man is 98°, enables them to endure a degree of cold which is somewhat astonishing. On the bleak shores of Terra del Fuego, humming-birds, the tiniest and most delicately formed of the feathered tribes, have been seen during a snow-storm hovering over the expanded blossoms of a fuchsia. Birds are divided into seven orders, their features and functions being assumed as the basis of classification.

First, Na-ta-to'-res [*νато*, I swim], swimmers: they are web-footed, and their delight is on the ocean. This order is subdivided into five families: First, Al'-ci-dæ [*αλκα*, auk; and *ειδος* like or form]; as the great auk, or penguin; the little auk, or black and white divers; and the Labrador auk or puffin. Second, Co-lym'-bi-dæ [*κολυμβι*, divers], divers, loons. Third, Pel-i-can'-i-dæ [*πελικαν*]: cormorants, pelican, &c. Fourth, Lar'-i-dæ

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[gulls]; gulls, petrels, albatross. Fifth, A-nat'-i-dæ [anas, duck; *ιδος* like]: ducks, geese, swans.

Second order, Gral la-to'-res [grallæ, stilts; long-legged birds] or waders, those adapted to walk in shallow water, in which they obtain their food. Its families are four. First, the Char-a-dri'-a-dæ [plovers]: plover, sand-piper, lapwings. Second, Ral'-li-dæ [rail]: rail, coot, crake, flamingo. Third, Scol-lo-pa'-ci-dæ [snipe]: snipe, woodcock, curlew, ruff, avocet. Fourth, Ar-de'-i-dæ [heron]: herons, bittern, crane, stork, ibis, white spoonbill.

Third order, Cur-so'-res [curro, I run]: embraces those birds which, though not wingless, have not the power of flight: they approach, in structure, nearest to quadrupeds; attain the greatest dimensions, and have their feathers of curious construction. It embraces the four following families: First, Di'-dus [dodo], now considered as fossil, though it has but recently become so. Second, Ap'-ter-yx Aus-tra'-lis, the apteryx. Third, Cas-so-wa'-ri-us [cassowary]: emu and cassowary. Fourth, Struth-i-on'-i-dæ [struthio, an ostrich—sometimes called the camel-bird]: the ostrich—largest bird; rhe-a or American ostrich.

Fourth order, Ra-so'-res [rado, I scratch]; gallinaceous birds, or scratchers. This includes those birds whose feet are provided with obtuse claws for scratching up grain &c. The upper mandible is vaulted, with the nostrils pierced in a membranous space at its base, and covered with a cartilaginous scale. The families of this order are four in number. First, Co-lum'-bi-dæ [columbus, a dove; and *ιδος* like], doves, pigeons. Second, Te-tra-on'-i-dæ [tetrao, a moor fowl], partridges, quails, grouse. Third, Cra'-ci-dæ [curasow], curasow-birds, guans, hoazin. Fourth, Pha-si-an'-i-dæ [phasianus, a pheasant—so called from the supposition that they were first found on the banks of the Phasis, in Asia Minor], pheasants, barn-yard fowls, turkey, peacock, and guinea fowl.

Fifth order, Scan-so'-res [scando, I climb], climbers, containing four families, namely: First, Psitta'-ci-dæ [ψιττακη a parrot]; all the parrot tribe; parrots, parrakeet, cockatoo, macaw. Second, Ram-phas'-ti-dæ [ραμφος a beak], toucans; toucan, toucanets. Third, Cu-cul-i-dæ [cuckoo], cuckoos. The American species faithfully pair and take care of their young.

Fourth, Pi'-ci-dæ [picus, a woodpecker], woodpecker, wryneck. Sixth order, In-ces-so'-res [insector, one who sits; from insideo, to sit or rest in or upon], perchers, birds that pass much of their time when awake, and all of it when asleep, on the branches of trees, &c. It is divided into four families: First, Ten-u-i-ros'-tres [tenuis, slender or fine; and rostrum, a beak], slender-beaked birds, humming-birds, hoopoes and creepers. To this family belong the humming-birds, the smallest of birds. They are found from Cape Horn to Baffin's Bay, and are almost cosmopolite in their migrations, though it is within the tropics they are most at home. Second, Fis-si-ros'-tres [fissio; a cleaving, dividing], split-bills, so called from the formation of their beaks, which appear as if they had been slit up from their ordinary termination to a point beyond the eyes, thus somewhat resembling the mouth of a frog, for the purpose of more easily securing their prey; kingfisher, bee-eater, swallow, goat-sucker. Third, Den-ti-ros'-tres [dens; a tooth], tooth-billed birds, nightingale, thrush, fly-catchers, shrike. Fourth, Con-i-ros'-tres, cone-shape beaked; crow, starling, finches, crossbill, hornbill, jay, magpie, jackdaw.

Seventh order, Ac-cip'-i-tres [accipiter, a hawk; from ad to, and capio, I seize] or Rapto'-res [raptor, a robber; from rapio, I rob, carry off by force], all birds of prey: they live by rapine, and hence are called raveners or rapacious birds. Their beaks are sharp-pointed, sharp-edged, curved and strong; their legs are short, robust, with three toes before and one behind, armed with long, strong, crooked talons. The condor, whose wings when expanded measure sixteen feet, is the largest bird that flies. The eagle is called king of birds. In this order four families are found. First, Strig'-i-dæ [strix, owl], owls; hawk-owl, snowy-owl, burrowing-owl, scops eared-owl, great eared-owl, and barn-owl. Second, Fal-con'-i-dæ [falco, a falcon or hawk], falcons, hawks, griffin, kites. Third, Aqu'-li-dæ [aquila, eagle], all kinds of eagles. Fourth, Vul-tur'-i-dæ [vultur, a vulture], vultures of every description. Of this powerful bird Humboldt says: "The condor, the giant of the vulture tribe, often soared over our heads above all the summits of the Andes, at an altitude higher than would be the Peak of Teneriffe if piled on the snow-covered crests of the Pyrenees. The rapacity of this powerful bird attracts him to those regions, whence his far-seeing eye may discern the objects of his pursuit, the soft-wooled vicunas, which, wandering in herds, fre-

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FIFTH CLASS, MAM-MA'-LI-A [mamma, breast], are distinguished from the other departments of the animal kingdom by a much greater development of brain and, consequently, a higher degree of intelligence; while the exquisite perfection of the organs of sense, the structure and arrangement of the teeth, and the beautiful provision for the nourishment of their young, manifest the creative power of an Infinitely wise and Almighty Being. Some naturalists divide this class into two sub-classes—the Viviparous, and the Oviparous Mammals. In the latter, few members are found; while in the former all the larger and better known species are perfectly arranged. When classified according to the relative intelligence of the different orders, we have: First, those that are in some respects closely connected with birds, called the Oviparous [producing young from eggs], embracing the first and second orders of the class, the Mon-o-trem'-a-ta and Mar-su-pi-a'-li-a; Second, the Phy-top'h'-a-gous [$\phi\upsilon\tau\omicron\nu$ a plant, and $\phi\alpha\gamma\omega$ I eat], those that live exclusively on vegetable food—the E-den-ta'-ta, Ro-den'-ti-a, Ru-mi-nan'-ti-a and Pach-y-derm'-a-ta; Third, the Zo-oph'-a-gous [$\zeta\omega\omicron\nu$ animal, and $\phi\alpha\gamma\omega$ I eat], those that feed on animals, animal-feeders—the Ce-ta'-ce-a, Chei-rop'-ter-a, In-sec-tiv'-o-ra, Car-niv'-o-ra, Quad-ru'-ma-na, and, Lastly, Bi-ma'-na, man. About 1500 species of this class have been described. The number may probably reach 2000. The paucity of its species is far more than compensated by the compactness, size, and intellectual development of its members: moreover man, the perfection of animated creation, the grand crowning type of all creatures terrene, belongs thereto. His presence alone, at once, claims superiority as an inalienable prerogative. In him all animated cosmical creation centres: between him and the highest beast a chasm interposes, down which, however great his degradation, he can never fall; and up which none of the lower creatures can ever ascend. His moral nature stamps him divine. His connection with immortality, and his relations to God, more than anything else, indicate his privilege and his destiny. Nevertheless the fine thought of Pascal is true to nature and to man: "Man is but a reed, the feeblest thing in nature. But he is a reed that thinks. It needs not that the universe arm itself to crush him. A drop of water, an exhalation is sufficient to destroy him. But were the universe to crush him, man is yet nobler than the universe, for he knows that he dies; and the universe, in

prevailing against him, knows not its power." "In nature there is nothing great but man; in man there is nothing great but mind." This class—the highest, the most important and noblest in the animal kingdom—is divided into twelve orders:—

First order, Monotrem'ata [*μονος* one, *τρημα* perforation], containing but two species, the or'-ni-tho-rhynch'-us [*ορνις* a bird, and *βυρχος* a beak], and e-chid'-na or spiny ant-eater, indigenous in Australia, where, in harmony with the idea that everything there seems to be reversed, "the thick end of a pear is next the stem, and the stone of a cherry grows outside," these creatures have their abode. The former of them is called, besides the name given above, the paradoxus [puzzling], duck-billed platypus [flat foot], and by the natives, water-mole. It, and the ostrich, though they have very little in common among themselves, form the connecting links between birds and mammals.

Second order, Marsupia'lia [marsupium, a pouch], embracing the families of—First, the Wom'bat; Second, Kangaroo' and Kangaroo'-rats; Third, Phalan'gers and Flying-Opos'sums; Fourth, Koa'la and Opos'sums; Fifth, Sar-coph'-a-ga [*σαρξ* flesh, *φαγω* I eat], flesh eaters, such as the da-sy'-u-rus.

Third order, Edenta'ta [e, without; dens, a tooth], toothless animals. Two families: First, Tardigra'da, so called from their slowness of motion, containing the sloths. Second, Edentata-proper, containing the ant-eaters, armadil'loes, pan'golin, &c.

Fourth order, Roden'tia [rodo, I gnaw], gnawing animals: embraces the seven families following: First, Sciur'idæ [sciurus, a squirrel; and *ειδος* like: N. B.—Wherever the termination idæ occurs throughout the Chart, its derivation and meaning being the same, render their repetition unnecessary], squirrels, marmots, prairie-dog or barking squirrel. Second, Mur'idæ, [mus, a mouse], mice, rats, jerboa or jumping-rat. Third, Castor'idæ [castor, beaver], beaver, voles, water-rats. Fourth, Hystri'cidæ [*ιστριξ* a porcupine], porcupine. Fifth, Cav'idæ [cavia], guinea-pig, capybara. Sixth, Chinchil'idæ, chinchillas. Seventh, Lepor'idæ [lepus, a hare], hare, rabbit.

Fifth order, Ru-mi-nan'-ti-a [rumino, I chew the cud], those creatures which, being the prey of the Carna'ria, do not require to chew their food, like other animals, when feeding; but simply swallow it and then, retiring to a place of safety, properly chew their food. The following are the families of it. First, Antelop'idæ, antelopes, chamois [pronounced sham'-my or sha-moi']

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gnu, vicu'nas. Second, Cap'idæ [capra, goat], goats, sheep, ibex. Third, Bov'idæ [bos, an ox], ox, buffalo, musk-ox, brahmin-bull. Fourth, Cerv'idæ [cervus, a stag], stag, elk, reindeer. Fifth, Camelopar'dæ [camel, and leopard], giraffe. Sixth, Mos'chidæ, musk-deer. It connects the deer and camel tribes. Seventh, Camel'idæ, camel, llama.

Sixth order, Pach-y-derm'-a-ta [παχυ thick, δερμα skin], thick-skinned animals: five families are embraced in it. First, Mana'tidæ, sea-cow. Second, Solidun'gula or E'quidæ [solid-hoofed; equus, horse], horse, ass, zebra, mule, quagga. Third, Tapir'idæ, tapir, rhinoc'eros [ῥι nose, κερως a horn], hy'rax. Fourth, Su'idæ [sus, pig], swine or pig, hippopot'amus [ἵππος horse, ποταμος river], babyrous'sa. Fifth, Probos'cidæ [προβοσκis a trunk or proboscis], elephant and its extinct congeners.

Seventh order, Ceta'cea [cetus, whale]: contains two families: First, Delphin'idæ, dolphin, porpoise, narwhal. Second, Balæ'nidæ [βαλαιν a whale], whale kind, whale, cach'alot.

Eighth order, Chei-rop'-ter-a [χειρ hand, πτερον wing], wing-handed, so called from the singular manner in which their forepaws or hands are developed into wings. Five families of bats now claim our attention. First, Rhinolophi'næ [ῥι nose]: nose-leaf complicated and membranous, only one joint in the forefinger, wings broad and large; horse-shoe bat. Second, Phyllostom'inæ [φύλλον a leaf, and στόμα mouth]: nasal appendage simple and fleshy, index-finger two joints; vampire-bats. The wings measure between two and three feet across. Third, Vespertilion'idæ [vespertilio, a bat]: destitute of nasal appendages, and have one joint only in fore-finger; bats of the temperate climates. Fourth, Noctilion'idæ: destitute of nasal appendages, but have two joints on forefinger: almost exclusively confined to tropical climates. Fifth, Pteropi'næ [πτερον a wing], the omnivorous or frugivorous bats, widely diffused throughout warm climates. "The office of this group in the economy of nature, is evidently to assist birds in restraining the too rapid multiplication of insects, and to keep down the luxuriance of tropical vegetation."

Ninth order, In-sec-tiv'-o-ra [insectus, an insect; and voro, I devour], insect-eating animals. Four families distinguish these creatures. First, Tu-pai'-a-dæ, tupaia or banx'ring. Second, Erinace'adæ [erinaceus, a hedgehog], hedgehogs. Third, Sori'cidæ [sorex soricis, field-mouse], shrew. Fourth, Tal'pidæ [talpa, mole], moles; chrysochloris or cape-mole.

Tenth order, Car-niv'-o-ra [caro, carnis, flesh ; voro, I eat], flesh-eaters. It embraces the five following families: First, Pho'-cidæ (phoca, seal), the Amphibia of Cuvier; seal, walrus, morse, sea-cow or sea-horse, and elephant-seal. Second, Ur'sidæ (ursa, a bear), bears, racoons, coati-mon'di, kinkajou, badgers, taxels or badgers of America, and the wolverine or glutton: the last four, by many naturalists, are considered as a connecting link between the Ur'sidæ and Mustel'idæ. This family forms the only true plantigrade Carnivora. Third, Mustel'idæ (mustela, a weasel) or weasel tribe; also called Vermiform [worm-like], from the shape of the body: weasels, martens, sable [martes leucopus], polecat, stoat, otter, ratel. The glutton and badger are placed by some naturalists in this family. Fourth, Can'idæ [canis, dog], dogs of all descriptions, wolf, jackal, fox, hyena and civet, which latter two are placed by some naturalists among the Fel'idæ, and ichneu'mon. The domestication of the dog is the greatest conquest achieved by man over the brute creation, as by his aid he can overcome all the rest. His sagacity, fidelity and devotion are proverbial. He is susceptible of very great improvement. Sir Walter Scott said he could believe anything of a dog. Fifth, Fel'idæ [felis, a cat], cat, lion, tiger, ounce, jaguar, puma ocelot, lynx, Canada lynx, panther, leopard. These creatures, like the noble falcons, it is said, never eat the flesh of animals they have not themselves killed, except when tamed or confined.

Eleventh order, Quad-ru'-ma-na (quatuor, four; manus, hand), four-handed. Three orders of monkeys are distinctly marked out by naturalists. First, Lemur'idæ (lemura, ghost), monkeys of Madagas'car and parts of Africa and India. Second, Ce'bidæ [κῆβος a monkey], pronounced Kebide; American monkey, spider monkey, and howling monkey. Third, Simi'a-dæ [simia, an ape], apes, chimpanzee, ourang-outang, baboons, gibbon, kahau or proboscis monkey, entellus monkey, mandrill, monkeys of the old world generally.

Twelfth order, Bi-ma'-na [bis, twice; manus, hand], two-handed, comprehends the whole Human family. Family, Homin'idæ [homo, man; ὁμοῖς like]: genus Homo, man. Species, sapiens [wise]. Varieties, negro, indian, malay, mongolian and caucasian. Pickering enumerates eleven races of men, all of which he had seen. 1. Negro: number 55,000,000. 2. Australian, 500,000. 3. Ethiopian, 5,000,000. 4. Telingan or East-Indian race, 60,000,000. 5. Negrillo: inhabit parts of Papua,

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Solomon's Isles, &c. ; 3,000,000. 6. Papuan : parts of the same islands ; 3,000,000. 7. Malay race, 120,000,000. 8. Hot- tentot and Bushmen, 500,000. 9. Mongolian, 300,000,000. 10. Abyssinian, 3,000,000 : and 11. Arabian race, 350,000,000. Population of globe, 900,000,000. Some geographers place it as high as one thousand millions.

GEOGRAPHICAL DISTRIBUTION OF ANIMALS.

While almost all animals are restricted to one particular local- ity, where alone they thrive and reach the full development and perfection of their symmetry, man is free to roam throughout the wide extent of Nature's domain. His reasoning faculties enable him to accommodate himself to every varied circumstance. He is at home on the burning sands of the tropics, or amid the ever- lasting snows of the polar regions ;—in the dungeon's gloom, where no ray of sunlight ever pierces, or on the summit of some lofty mountain which raises its towering crest far above the re- gion of perpetual congelation.

At the poles vegetation is stunted. Lichens, mosses and other cryptog'amous plants constitute the flora of these inhospitable re- gions. The animal kingdom, though better represented, is still inferior. The number of types is small, and marine animals pre- ponderate. Superior types receive a fuller development in the temperate zone. Phanerog'amous plants preponderate. A de- cided progress is everywhere visible. A striking change may everywhere be seen as we approach the torrid zone. The cryp- tog'amous plants of the polar regions become arborescent. Grasses attain a height of seventy feet. A density elsewhere unknown marks the forest, while an exuberant profusion of the most bril- liant flowers adorn and variegate the mountain and the plain. In the animal kingdom Nature is equally lavish. Birds are arrayed in the most gorgeous plumage. The huge pachydermata attain their fullest development, while the ferocious inhabitants of the jungle display a vigour and strength excessively disproportioned to their size. The ourang-outang stands erect, and would seem to trench on man's domain. The negro looks upon him as a de- generate brother, too lazy to work.

Man had his origin in the temperate zone. There civilization commenced, and in its western march it has spread to the north and to the south, but its highest achievements—its most splendid results have been within the zone which gave it birth. Up on careful analysis it will be found that the progress of whole conti-

nents, in commerce and the industrial arts, in morals and intellectual refinement, in science and civilization, and in the development of humanity in all its better phases, has been in some way connected with the square miles of surface which compose their territory, compared with their line of coast. The following table will show at a glance the comparative relation of each. Carl Ritter was the first who applied himself to investigate "what are the fundamental conditions of the form of the surface of the globe most favorable to the progress of man and of human societies;" and the table is based on his conclusions.

	Surface in Eng. sq. miles.	Length of coast line.	Miles of surface to one of coast	Population.	Do. to sq. mile.	Mean ele- vation in feet.
Europe	3,820,000	19,780	193	260,000,000	68	671
America	14,070,000	43,300	348	50,000,000	3½	N.A. 748 S.A. 1132
Asia	16,072,000	32,000	500	420,000,000	26	1151
Africa	11,570,000	16,200	714	88,000,000	7½	
Oceanica	4,100,000	-----	-----	25,000,000	6	

Of the geographical distribution of the lower animals little needs be said. At the left side of the Chart are given the various regions into which it has been proposed to divide the earth's surface, and the animals predominating in each. But it were a mistake to suppose the species confined to the localities or latitudes indicated by this division. Many of them have a much wider range. The animals wholly or for the most part peculiar to any region, climate, or country constitute the fauna thereof. Similar fauna may be found at great distances from each other, while others in close proximity may differ widely. Parts of Europe and of the United States have fauna of the same character; while those of the New-England States and Labrador differ materially. It not unfrequently happens that between the fauna and flora of places a direct connection may easily be traced. And wherever found, the instincts of animals invariably correspond with the physical characteristics of the countries they inhabit; though we are by no means to view these as cause and effect. Their distribution as well as their organization are the sequences of laws superior to the impress of surrounding circumstances and external influences, though these have a modifying effect. Thus we see that anterior to their creation the laws by which they are controlled were wisely designed by the Supreme Mind, who gave to each species, as to the

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great sea, limits which they never pass. Throughout the whole, adaptation of means to ends is constantly perceptible. This part of the chart is but an approximation, as the smallness of space precludes the introduction of more minute subdivisions. He who would comprehend the plan upon which the Animal Kingdom has been arranged, must study the remains of extinct genera as well as those now walking the earth,—the one as the complement of the other,—and thus only can we have a correct idea of the system of Zoology.

The following are the provinces into which the continental portions of our globe have been divided on the principle of the doctrine of specific centres of animals. In this division man is not included.

FIRST, the European region, comprehending Europe, the borders of the Mediterranean, the north of Africa, and extending into Asia beyond the Ural Mountains and the Caspian Sea. The bear, fox, hare, rabbit, deer, are widely distributed. The mole, confined to the north of Europe, ranges eastward to the Himalayan range.

SECOND, the African Fauna, singularly rich in generic forms, not met with in a living state in any other region. Chimpanzee, baboon, four-fingered monkeys (colobus), many carnivora, the hippopotamus, camelopard, &c. The elephant, camel, lion and jackal are common to Asia.

THIRD, South Africa: in the north of it are found the horse, ass; in the south the quagga and the zebra, rhinoceros, hog, hyrax, the spring-bok, the gnu, &c.

FOURTH, Madagascar, constituting a distinct zoological district. This is the home of the lemur, and the grave of the extinct dodo.

FIFTH, India, containing a vast variety of peculiar forms, such as the sloth-bear, musk-deer, elephant, royal tiger, the long-armed ape and many others.

SIXTH, a portion of the Indian Archipelago, Java, Sumatra, Borneo, &c.

SEVENTH, the Islands of Celebes, Amboina, Timor, and New Guinea; constituting a region allied to the Australian type, yet also showing an affinity to the Indian in such forms as the deer, weasel, pig. As we approach New Holland the marsupial type increases; tree-kangaroos and flying opossums, &c., are found in great numbers.

EIGHTH, Australia, the region of the pouched animals, such as the kangaroos, wombats, flying opossums, kangaroo-rats, or'-ni-tho-rhynch'-us [*ορνις*, *ορνιθος*, a bird; and *βυρρα* a beak]. Allied species of the opossum inhabit South America, Mexico, California; and one, the Virginian opossum, the United States.

NINTH, North America.

TENTH, the West-Indian Islands; and

ELEVENTH, South America, the most distinct, except Australia, of all the Provinces into which the Mammalia can be classed geographically. The prehensile-tailed quadrumana, the sloth, the true blood-sucking bats, or vampyres; the capybara, the largest of the rodents; and a host of other species, are exclusively characteristic of South America.

ZOOLOGICAL ERAS.

The diagram from Agassiz and Gould's *Principles of Zoology*, at the top of the chart on the right side, affords a very comprehensive view of the animals long since introduced, and many of them long since extinct.

The shape of the ray in which the name is placed, its commencement towards the centre, its expansion, contraction, and cessation, indicate whether the members were few or many, whether they increased or diminished in number; and the outward end shows the epoch when their being reached its termination. Thus the Ganoids were called into existence at the commencement of the Reign of Fishes—a very early period; increased in number towards the close of that age; continued nearly stationary during the Reign of Reptiles, and have been waning ever since. The Ammonites began at the same time as the Ganoids, but became extinct at the close of the Reign of Reptiles. The blank space at the centre is intended to represent that portion of our cosmical history which elapsed before any organized beings were called into existence. It may be called the first age of our planet. The eras of organic creation are thus described by the author of this sectional view of our earth's crust: We may distinguish four Ages of Nature corresponding to the great geological divisions, namely:

FIRST, THE PRIMARY OR PALEOZOIC AGE, comprising the Lower Silurian, the Upper Silurian, and the Devonian. During this age there were no air-breathing animals. The fishes were the masters of creation. We may, therefore, call it the *Reign of Fishes*.

SECOND, THE SECONDARY AGE, comprising the Carboniferous formation, the Trias, the Oölitic, and the Cretaceous formations. This is the epoch in which air-breathing animals first appear. Reptiles predominate over the other classes, and we may therefore call it the *Reign of Reptiles*.

THIRD, THE TERTIARY AGE, comprising the Tertiary formations. During this age, terrestrial mammals, of great size, abounded. This is the *Reign of Mammals*.

FOURTH, THE MODERN AGE, characterized by the appearance of the most perfect of all created beings. This is the *Reign of Man*.

As a general result of the inquiries hitherto made, it may be stated that the Paleozoic animals belong, for the most part, to the lower divisions of the different classes. The Secondary Age displays a greater variety of animals as well as plants. The fantastic forms of the Paleozoic Age disappear, and in their place we see a greater symmetry of shape. Many of the most abundant types of former epochs have now disappeared: and the most significant characteristic of the Tertiary faunas is their great resemblance to those of the present epoch. The Modern epoch succeeds to, but is not a continuation of, the Tertiary Age. These two epochs are separated by a great geological event, traces of which we see everywhere around us. This was the cooling of the temperate zone so that the glaciers of the polar regions moved much farther to the south of their previous limits. It was this ice, as it is supposed, either moving or floating along the ground, that polished and rounded the rocks scattered about upon the soil, called the erratics, boulders, or grayheads. This is the Glacial or Drift period, to which the soil of Canada belongs. At the left of the chart are given the great geologic periods—the Primary or Paleozoic [$\pi\alpha\lambda\lambda\alpha\iota\omicron\varsigma$ ancient, ζῶον animal], the Secondary or Mesozoic [$\mu\epsilon\sigma\omicron\varsigma$ middle, ζῶον animal], the Tertiary or Cainozoic [$\kappa\alpha\iota\omicron\varsigma$ recent, ζῶον animal];—their subdivisions—the various strata into which geologists from characteristics essentially different in each, have arranged and classified the stony leaves of this great book of nature, revealing truths hidden for ages, exhuming forms more strange and fantastic than those of an Arabian tale, over which extinction of species has long since drawn its oblivious veil, presenting to our gaze in panoramic disclosures the successive fauna and flora of our pre-human planet; affording us glimpses of the Creator's footsteps and the manner in which, in the universal profusion of life everywhere distributed, he has prepared the earth as

the residence of man. Exceptions to the onward order of things, sparks from the anvil of creation, shards from the footsteps of the Creator, the results of general laws may, like the minute seeds in the ground never to be vivified, occasionally be met with ; but to many minds they are no disparagement to Infinite Wisdom. I have mentioned the most important animal and vegetable remains found imbedded in each stratum, so far as space would permit. The comparative thickness is necessarily more or less hypothetical, as the same rocks are seldom found of uniform thickness in different localities. All the strata intervening between the Devonian and Silurian, and the Pliocene are absent in Canada. This is the reason why coal can never be found in this country.

COMPARATIVE ELEVATION OF SUB-KINGDOMS.

The diagram at the top of the geological strata, and inside of it, is intended to exhibit at a glance the comparative elevation of the four great sub-kingdoms of animated creation. The chain of being does not ascend in a straight unbroken line, but by a series of lines diverging from one another at a point near their upper extremity in the ascending order of nature. The lowest sub-kingdom embraces not only the animals lowest in the scale of organization, but the lowest of the low are found at the lowest part of the line. And by a series of gradations, more or less orderly, more or less intricate and irregular, we ascend through each sub-kingdom, throughout the whole animal kingdom. It is worthy of notice that the lowest members of a higher order are truly lower in organization than the highest forms of the lower sub-kingdom : thus, the star-fish, the highest member of the lowest sub-kingdom Radiata, is much higher in the scale of being than the ascidia communis or paps, the lowest member of the second sub-kingdom, Mollusca. Again, the leeches and earth-worms, members of a higher sub-kingdom, are less elaborately organized than the cunning, ferocious, and sharp-sighted cuttlefish, the highest of the Mollusks. Lastly, the spiders, the highest of the third sub-kingdom, are much more complex, and adapted to a higher sphere of existence than that worm-like fish, the hag or myxine [*gastrobranchus cæcus*], and another fish called the lancelet [*amphioxus lanceolatus*]. Man, simply considered as an animal, crowns all : his form is unrivalled, his claims undisputed ; for instinct he has reason, and to the range of his faculties no limits are assigned.

EXPLANATION OF OTHER DIAGRAMS.

In the diagram just above the last one, man, whose zoological

position is indicated by a vertical line, is regarded as the perfection of animated creation: while the position of the lower animals is pointed out by lines at greater or less angles, as they recede from or approach man in organization and intelligence: thus the class *Mammalia* is nearer than *Aves* or *Birds*, and the eleventh or highest order of *Mammals*, *Quadrumana*, is much less remote than the *Monotrem'ata*, the first or lowest order of the same class. The zoological position of a bird is given at the right-hand side, at the top: want of space prevents its being given for all birds. The same for a fly, also at the top. On the left-hand side, about the middle, this is repeated for a dog, and at the bottom will be found the generic terms used by naturalists in giving a description of animals. This description should be so comprehensive as to include all, and so precise as to apply to each member of the series; these objects, so desirable, are attained by this systematic arrangement, or natural system.

MODE OF USING THE CHART.

In the investigation of truth, two methods present themselves: first, the analytical (*ἀνα* again, *λυω* I loose) method, or analysis, in which the whole is separated into its component parts; in other words, the whole subject, whatever it may be, is first considered as a whole, and then decomposed for the special consideration of its parts. This is the method used in Algebra. The other method is the synthetic [*συν* together, *τιθημι* I place or set] or synthesis. In this method the elements in their isolated state are first examined, carefully mastered, and then united for the purpose of contemplating them in their symmetry and united relations. This is the method pursued in Geometry, in Grammar, in History, &c. In using the Chart either method may be adopted. A general idea of the Empire of Nature may be given, then its subdivisions, then the further subdivisions of these, carefully mastering each successive step till all are well impressed on the mind. Or the lowest subdivisions may be first studied, and as one after another has been committed to memory, the whole should be grouped together; so that at each successive step what we have passed over may be referred to the next higher group. Thus, suppose the families of Cud-chewing animals be under consideration; after they had separately been described—in number, size, habits, instincts, uses to man, modes of life, geographical distribution, &c.—then the whole should be placed together and viewed in this new aspect, as joined by a common bond characteristic of the whole, though dif-

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fering in many minor respects. When the families of all the orders are thus gone over, the orders themselves are placed together, thus forming a Class; these in their turn constitute a Sub-kingdom; these again Kingdoms, which in their turn united form the Empire of Nature.

A very good mode is the following:—In giving the family to which the being under consideration belongs, to make the pupils state the order, class, sub-kingdom, and kingdom, of which this particular family is a unit. Say, for example, the lesson is about the horse: describe as above, then give its zoological position—Family Equidæ (equus, horse; ἵππος like), embracing all horse-like animals, horse, ass, zebra, &c.: Order Pachydermata; mention other members of the order: Class Mammalia, suck-giving animals; Sub-kingdom Vertebrata, containing all creatures with a jointed back-bone; Kingdom Animal, embracing all the creatures on earth; and lastly Empire of Nature, as existing on earth: this would be the synthetic method. Or take the analytic: a horse belongs to the Empire of Nature, because it exists; Animal Kingdom, because it has life, motion and feeling; Sub-kingdom, Vertebrata, because it has a jointed back-bone; Class, Mammalia, because it brings forth its young alive, and afterwards supports them by suckling; Order, Pachydermata, because it is a thick-skinned animal; Family, Equidæ, because it belongs to the horse kind: thus stating the reason at every step, completely mastering every inch of the space traversed; thereby adding vigor to the mind, and preparing it for new acquisitions in the boundless ocean of existence, in the illimitable domains of God.

In giving instruction to children, the eye as well as the ear should be on the subject under consideration. "The eye remembers." In Natural History the object itself, when practicable, should be placed before the pupils. Their conceptions will thus be more vivid, the impression more lasting, and the ideas more correct. In the study of Ornithology for example. The initial types may be collected, and one at least of each order in a class exhibited. These being all properly arranged and labelled, the interest in the study would be greatly enhanced. To teachers desirous of making the experiment, such collections could be furnished at a moderate sum. In teaching Natural History it will be found beneficial, First, to describe the animal; Second, its habits, instincts and mode of life; Third, geographical range of the species; Fourth, zoological position; Fifth, uses to man; and Sixth, the evidences it displays of the wisdom and goodness of God.

AN OBJECT LESSON.

In giving object lessons,—when a specimen of the animal to be described cannot be had, a picture of it should be placed before the class, that all the pupils may see it; and also a map of the World, that the teacher may point to the place where such animal may be found in its greatest perfection. When the description has been given slowly and distinctly, so as to be understood by all, the teacher should then commence a series of questions on the lesson, first in a general way to inspire courage, and then individually to secure accuracy. As a matter of course, the more clearly and methodically the lesson is enunciated, the more prompt and correct will be the answers given. With the teacher rests the prerogative of making even a dry theme interesting and fascinating. The following mode has been followed with advantage:—

THE SHEEP.

The Sheep is one of the most important of our domesticated animals. It is a quadruped, as you see, having four feet. It is a ruminant, or ruminating animal, because it chews the cud. It is about three feet, four inches long; and six hands high; varying in size and appearance in the different countries to which it belongs. The sheep is covered with wool, a soft species of hair with an imbricated surface. The face and legs are covered with hair. The hoofs are cloyen, consisting of two longer and two shorter parts, the longer parts only touching the ground. The ears are usually erect, though in some cases pendulous, and are far back in the head. The pupil of the eye is somewhat in the form of a horizontal oblong, thus affording a very good range of vision along the ground. The dental characteristics of the sheep, as of all ruminants, are thus expressed in Zoology: incisors $\frac{0}{2}$, canine $\frac{0}{2}$, molars $\frac{3}{2}$. Many consider the last incisor on each side as truly canine. This would give the following division: incisors $\frac{0}{2}$, canine $\frac{0}{2}$, molars $\frac{3}{2}$. Its age is determined by the incisor teeth. When two years old, two of the deciduous teeth give place to permanent ones; two more at the end of three years, and the rest at the end of the fourth year; after which the age cannot be accurately determined. The molars are crowned with two ridges of enamel, which aid in the process of mastication. The grass is cut by the front teeth of the lower jaw, pressed against the strong muscular upper lip. Like all ruminants the sheep has four stomachs, or perhaps four compartments in one stomach. The first and largest, called the *paunch* or *rumen*, receives the food as it

is swallowed, and retains it till it is softened. It then passes into the second, called *honey-comb*, or *reticulum*, a term signifying a little net or bag. Here the food remains until it swells and ferments. By the alternate dilatation and contraction of the stomach, the food is formed into small portions termed cuds, which are again taken back to the mouth to be remasticated at leisure, while the sheep is not grazing. The food thus remasticated passes into the third stomach, where it undergoes a still further comminution and then passes into the fourth stomach, where it undergoes complete maceration, and the chyle is extracted from the various matters which have been reduced into pulp in the other compartments.

2nd. Habits, mode of life, &c. The habits of the sheep are so well known generally, as to require very few remarks. Sheep usually go in large flocks, under the care of shepherds, and depend for their protection on the fostering care of man. They are tame, gentle and inoffensive in their disposition, and display less animation and sagacity than most other quadrupeds, although they are very discriminating in the selection of their food, and acutely susceptible of the approach of a storm. In such cases they seek the lee side of some hill or cliff, where they may be secure from the biting blast. The great aim of the shepherd is to keep them from such shelter, when no proper pens or folds are near, as during snow-storms they are often buried by the drifting snow when they follow their natural instincts for preservation. Although a prey to almost every carnivorous animal, they will in case of attack, present to the enemy the united strength of the flock drawn up in a compact body, presenting towards every point a determined front which cannot be attacked without injury to the assailant. The following anecdote furnishes a beautiful proof of the maternal instinct of the sheep. A gentleman travelling, received a strong proof of sagacity in a sheep that came bleating piteously to meet him. When near, she redoubled her cries and looked up in his face, as if to ask his assistance. Alighting, he followed her: she led him to a cairn at a considerable distance from the road, where he found her lamb, wedged in between two large stones, struggling with its legs uppermost. He extricated the little sufferer and placed it on the green-sward beside its dam; and the mother poured forth her thanks in a long and continued bleat. A man was driving a flock of sheep across a bridge, when, by some means or other, one of the foremost, getting frightened, jumped over the side of the bridge, and, before they could be prevented,

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many of the rest followed, and were drowned in the river. A monkey came down from a tree to steal the breakfast of a shepherd, who was resting under it with his flock of sheep and goats. He drove the monkey away, which, in his hurry, upset a bee's nest; the insects flew out and attacked, not only the intruder, but the goats and sheep underneath. The curious part was to witness the behaviour of the two species. The sheep crowded together, buried their noses in the sand, and did not attempt to resist, but bleated piteously. The goats ran as fast as they could to an encamping party close by; seeking the assistance of man, as dogs would have done. In the following anecdote we have an illustration of their attachment to place. A female sheep with her lamb made a journey of nine days' length, to return to her native place, and was tracked so completely as to make her owners acquainted with her adventure. Nothing turned her back, and whenever her lamb lagged behind, she urged him on with her impatient bleating. When she reached Stirling it was *fair-day*, and she dared not venture into the crowd: she therefore laid herself down by the roadside, with her lamb, outside the town, and early next morning stole through the streets. She came to a toll-bar, the keeper of which stopped her, thinking she had strayed and would shortly be claimed. She frequently tried to get through the gate, but was as often prevented; and she patiently turned back. At last she found some means of overcoming the obstacle; for, on the ninth day, she with her lamb reached her destination, where she was re-purchased, and remained till she died of old age, in her seventeenth year.

3rd. Geographical range. No quadruped presents greater variety of form, size, and general appearance, or occupies a wider range of climate than the sheep. They abound in the elevated plateaus of Asia, and are found in the valley of the Nile, in the northern part of Europe, and in the southern portions of Australia; on the Atlantic coast of America, and on the shores of the Pacific. Mountain, plain, hill and valley, yield in profusion the food they require. The principal varieties of the wild sheep are: 1st. The Musimon (*Ovis Musimon*, a mongrel creature), inhabiting the mountainous parts of Spain, Greece, Corsica, and other islands of the Mediterranean. 2nd. The Argali (*O. Ammon*), which roam over the table lands of Asia, and are larger, more hardy and less tameable than the Musimon. 3rd. The Rocky-Mountain Sheep (*O. Montana*), called by western hunters Big-horn: they resemble the Argali, from which they probably have sprung;

abound on the prairies west of the Mississippi to the Pacific. It is highly probable that the goats of which Father Hennepin, a French Jesuit who travelled through the territory now called the Western States and wrote nearly two hundred years ago, speaks, are this species of sheep. 4th. The Bearded Sheep of Africa (*O. Tragelaphos*—*τράγος* goat, and *ελαφος* stag; goat-stag): it inhabits the mountains of Barbary, Egypt, &c. They have a mane hanging below the neck, and large locks of hair at the ankles. Then, The Common Domestic Sheep (*O. Aries*—the ram), the Merino, the Saxon, and the Rambouillet. The best breeds in England are the South Down, the Cheviot, and the Bakewell or Leicestershire: inferior to them in some respects are the Cotswold or Lincolnshire sheep.

The number of sheep in Great Britain is 40 millions, valued at (\$6 25 each,) \$250 millions; in the United States, 21,722,000, valued at (\$1 50 each), \$32,582,568; in Canada, 1,600,000, valued at (1 50 each), \$2,400,000; in Canada West, 968,000, valued at (\$1 50 each), \$1,452,032. The annual produce of wool in United States, 52,789,174 lbs.; in Canada, 4,130,740 lbs.; in Canada West, 2,700,000 lbs. Average weight of fleece in United States, $2\frac{1}{8}$ lbs.; in Canada, $2\frac{1}{2}$ lbs.; in Canada West, $2\frac{1}{4}$ lbs. The sheep in Canada and United States are not indigenous, having been imported chiefly from Great Britain, France, and Spain.

4th. *Zoological position*.—The sheep belongs to the Empire of Nature, because it exists; secondly, to the Animal Kingdom, because it is endowed with life, sensation, and the power of voluntary motion; thirdly, Sub-kingdom, Vertebrata, because it has a jointed back-bone; fourthly, Class, Mammalia, because it brings forth its young alive, and afterwards suckles them; fifthly, Order, Ruminantia, the members of which chew their cud; sixthly, Family, Capridæ, because it is of the goat kind; seventhly, Genus, *Ovis*, which embraces only the sheep kind; eighthly, it belongs to the Species *O. Aries*, which includes all the domesticated sheep; ninthly, Variety, Merino, a kind of Spanish sheep celebrated for the fine texture of its wool; tenthly, it is an Individual of that Variety.

6. *Uses to man*.—From the sheep man obtains a great portion of his aliment, and also the most essential part of his clothing. The flesh of the sheep is called mutton, the quality and flavour of which depend upon the particular breed. The largest breed of sheep in Britain is found on the banks of the Tees, in that fertile valley which separates Yorkshire from Durham. Some of them have been fed to weigh fifty pounds per quarter. Bigland mentions one as having weighed sixty-two pounds and a half per quarter, and then supposed to be the heaviest sheep ever slaughtered in Britain. The Dorsetshire sheep are remarked for their extraordinary fecundity, being capable of producing

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twice a year. From this breed the tables of the opulent are supplied with early lamb at Christmas. In the north-west parts of England there is a hardy, black-faced breed, the flesh of which is esteemed excellent. In the northern parts of Scotland there is a small-sized breed of sheep which is remarkable for the fineness of its mutton. The Leicestershire sheep is held in great esteem, in consequence of its fattening quickly and carrying the greatest weight of mutton on the smallest proportion of bone. The broad-tailed sheep, common in Persia, Syria, Barbary and Egypt, are remarkable chiefly for their large, heavy tails, which are esteemed a great delicacy, being of a substance between fat and marrow. The tails of these sheep are frequently a foot broad, and weigh from twenty to seventy pounds. From the skin of the sheep, leather, parchment, covers for books and other things are made; and glue is made from their hoofs and horns. Their entrails are manufactured into strings for musical instruments, their bones are ground into dust to manure the soil, and butter and cheese can be made from their milk. We read in Joshua, vi. 6, of ram's horns being used as trumpets by the priests who surrounded the walls of Jericho previous to the destruction of that city. The fleece of the sheep is, however, the most important article of utility to man. From the wool of the sheep the principal part of his clothing is made. The quality of the wool depends upon the breed of the sheep. The following are the varieties in Britain:—

1. The Zetland sheep. The finest fabrics are made of their wool, which forms a fine fur.
2. The Dunwooled sheep, at one time cultivated extensively. Remnants of them still exist in Scotland, Wales and the Isle of Man.
3. The Black-faced Heath-sheep, inhabiting heathy mountains. They have spiral horns. Their legs and faces are black. Their wool is coarse, weighing from three to four pounds per fleece. They yield the most delicious mutton, weighing from ten to sixteen pounds per quarter. They are to be found in Yorkshire, Cumberland, Westmoreland, Argyleshire and the central Highlands of Scotland.
4. The Moorland-sheep of Devonshire. They have horns, white legs and faces, long wool, and are of a hardy constitution. Their wool weighs four pounds the fleece.
5. The Cheviot sheep, which are indigenous to the Cheviot Mountains. Their wool is fine. A medium fleece weighs about three pounds. When fat they weigh from twelve to eighteen pounds per quarter.
6. The Horned Varieties of Fine-wooled sheep of Norfolk, Wiltshire and Dorset. These sheep have large, spiral horns: their fleece weighs from two to four pounds.
7. The Ryeland-sheep of Herefordshire, white-faced and without horns; wool fine, weighing from one and a half to two pounds a fleece. Their mutton is delicate. They fatten easily, and weigh from twelve to sixteen pounds per quarter.
8. The South-Down breed, inhabiting the chalky downs of England and the sheltered lawns of Scotland. They have no horns, their legs and faces are grey; their wool is fine and from two to three inches long, and weighing from two and a half to three pounds a fleece. Their mutton is excellent and highly flavored. When fat they weigh from fifteen to eighteen pounds per quarter.
9. The Merino sheep, supposed to have been brought originally from Africa. The wool of this breed is finer than that of any other sheep.
10. The

Devonshire, Romney-Marsh, Old-Lincolnshire and Old-Leicester breeds. The Devonshire-Notts yields a fleece weighing ten pounds; and, when fat, weighs twenty-two pounds per quarter. The Romney-Marsh breeds are large animals, with white legs and faces, and yield a heavy fleece. The Old Lincolnshire yield indifferent mutton, but a fleece of very heavy, long wool. The Old Leicester is a variety of the coarse, long-wooled breeds. 11. The New-Leicester and Improved Teeswater, the great properties of which are their early maturity and disposition to fatten, in which they excel all other breeds. No country produces finer sheep than Great Britain. Yet such is the extent of their woolled manufactures, that they import nearly as much as they grow. Upward of 340,000 persons are employed in these manufactories in Britain alone; and, when we take into account the families which are dependent on these operatives, and the thousands of machinists and other mechanics employed in making the machinery for these factories, and the families which are dependent upon them, and the thousands of merchants, and clerks, and shopkeepers whose business it is to supply the public with the cloth after it has been manufactured, and the tailors and dress-makers whose decorative industry is so highly appreciated—when all these considerations, and many more that might be suggested are taken into account, we may form some idea of the use of this quadruped to man.

6. *Proofs of Divine Wisdom.*—The adaptation of this creature to live in every part of our habitable globe, by undergoing changes, especially in its woolly coat, corresponding with the climatic zone it inhabits—in the torrid zone, where heat is not wanted, it being covered with wool coarse as hair, but not less valuable on that account; in the frigid regions its wool being more like fur than its usual texture—its generic characteristics, its great usefulness to man, in civilized no less than savage life—all are indicative of the goodness and care of Him, whose wisdom is infinite, and all whose operations tend to good and happiness.

The study of Natural History, besides being advantageous in other respects, is well calculated to redeem us from low views concerning the method and nature of God's government, and show us that all things are arranged and maintained according to a vast, comprehensive plan; the discovery of which is the object of the scientific zoologist as the general principles upon which it is based comprehend not only the manifest conformity to it, but likewise the apparent departure from it.

In conclusion I would indulge the hope that this attempt to present to the eye by means of the Chart, now amended, improved and illustrated, and this pamphlet, a complete system of classification on this new plan, different from anything hitherto presented to the world—may promote the introduction, into our common schools, through my fellow-labourers, our common-school teachers, for whose benefit, convenience and use both were prepared, of a study which ranks among the noblest that can occupy the mind of man:—it gives a nearer view of the character and attributes of the Creator, whose omnipotence, wisdom and love are so clearly manifested in his handiwork.

RECOMMENDATIONS.

Toronto, 12th June, 1856.

I have carefully examined the Chart of Natural History prepared by Mr. Macallum of the Model School, and consider it well worthy of the favourable opinion and support of all persons feeling an interest in Education. Upon my recommendation, the Board of School Trustees of this City have ordered twelve copies for the use of the Common Schools under their charge. The ability shown by Mr. Macallum, in the arrangement of the divisions and sub-divisions of the subject in question, is calculated to greatly assist the student in acquiring a correct knowledge of the Animal Kingdom: and both as a very ingenious system of imparting a knowledge of Natural History to young people, and as a highly creditable specimen of Canadian lithography, I cordially recommend Mr. Macallum's Chart to public favour.

G. A. BARBER.

Local Superintendent of Schools,
CITY OF TORONTO.

Toronto, June, 1856.

I have examined the "Chart of Natural History" constructed by Mr. Macallum, Head Master of the Provincial Model School, and have no hesitation in recommending it as likely to be very useful in conveying information on the subject, to young persons commencing the study of Natural History.

THOS. J. ROBERTSON,

Head Master Provincial Normal School.

TUESDAY MORNING, 17th June.

MY DEAR SIR,—On the recommendation of the Education Committee, the County Council voted £40, or so much thereof as may be required, to procure one copy of your Chart of Natural History for each Common School within these United Counties.

By resolution of the Council it is my duty to attend to their purchase and distribution.

There are, in the several Townships of the two Counties, 214 School Sections reported to the Council last year. Adding three each for the two villages of Yorkville and Brampton, we have 220 schools to supply. May I trouble you to see that the above number of Charts be reserved for our purpose? and as soon as I can find time to visit the Education Office I will attend to the matter.

Yours truly,

JOSEPH HARTMAN.

Toronto, June, 1856.

Having carefully examined a Chart of Natural History, prepared by A. Macallum, of the Provincial Model School, I deem it well calculated to assist teachers in imparting a correct and systematic knowledge of that most interesting subject even to young pupils.

It is compiled with accuracy, and executed with elegance.

It cannot fail of proving a very useful addition to the apparatus of any school-room.

W. ORMISTON.

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